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OVERLAND FLOOD STUDY & FLOOD IMPACT REPORT

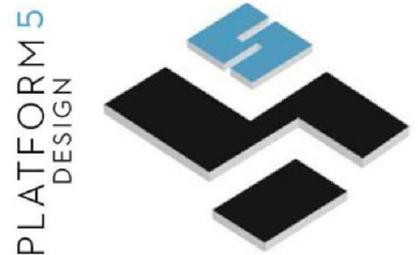
Proposed Residential Development

At

159 Jamison Road, Penrith

For

PLATFORM 5 DESIGN



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GLOSSARY

Annual Exceedance Probability (AEP)

The chance of a flood of a given or a larger size occurring in any one year, usually expressed as a percentage.

Australian Height Datum (AHD)

A common national surface level datum approximately corresponding to mean sea level.

Average Recurrence Interval (ARI)

The long-term average number of years between the occurrence of a flood as big as or larger than the selected event.

Catchment

The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.

Flood

Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse.

Flood Liable Land or Flood Prone Land

Land susceptible to flooding by the PMF.

Flood Planning Levels (FPLs)

Are the combinations of flood levels and freeboards selected for floodplain risk management purposes.

Freeboard

Is a factor of safety typically used in relation to the setting of floor levels.

Habitable Room

In industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to damage in the event of a flood.

Peak Discharge

The maximum discharge occurring during a flood event.

Probable Maximum Flood

PMF is the largest flood that could conceivably occur at a location, usually estimated from probable maximum precipitation.

Probable Maximum Precipitation

PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year.

Runoff

The amount of rainfall which actually ends up as stream flow.

1 INTRODUCTION

1.1 Brief

Alpha Engineering & Development has been engaged to carry out an overland flood study as part of the development application at 159 Jamison Road, Penrith.

The current flood study has been prepared to meet the Council's requirements. The flood study is required to assess the impact of the proposed development on the existing flood conditions of the subject site and the neighbouring properties.

1.2 Scope

The scope of this study covers:

- a) Hydrology calculation to establish the peak flow rate during all storm events including up to 1 in 100-year ARI event;
- b) Hydraulic calculation establishing the respective flood levels within the property, and adjoining properties;
- c) Pre-development flood behaviour, including the flood inundation line marked on the survey plan;
- d) Loss of flood storage within the subject lot due to the proposed development;
- e) Post-development flood behaviour, including the flow path construction details and the flood inundation line, marked on the site plan;
- f) The flood impact on adjoining properties (upstream and downstream) in the locality;
- g) Design measures including maintaining an unobstructed flow path, raising the building with appropriate freeboard and flood proofing the walls that form part of the flow path;
- h) Earthworks plan detailing the existing ground levels and the proposed design levels;

The report has been prepared in accordance with **Penrith City Council** Guidelines. Its contents include, but are not limited to:

- (i) 1 in 100 years ARI flood level;
- (ii) Pre and Post development cross - sections of the overland flow path
- (iii) Hydrological analysis of the catchment, showing all existing drainage infrastructure and flow regime.

1.3 Limitations

This report is intended solely for Platform Five Design as the client of Alpha Engineering and no liability will be accepted for use of the information contained in this report by other parties than this client.

This report is limited to visual observations and to the information including the referenced documents made available at the time when this report was written.

1.4 Reference Documents

For the purpose of the study, the following information has been supplied by the Council and the surveyor:

- (i) Survey Plan dated 13/10/2018 (**Appendix A**);
- (ii) Architectural Plan (**Appendix B**);
- (iii) Flood Information provided by Penrith City Council dated 09/11/2018 (**Appendix H**)
- (iv) Catchment Map provided by Penrith City Council (**Appendix I**)
- (v) NSW Government Floodplain Development Manual – The management of Flood Liable Land (2005)
- (vi) Engineers Australia, Australian Rainfall & Runoff (AR&R 1999) and (AR&R 2016 and Revision Projects)

2 EXISTING SITE CONDITIONS

The subject site (159 Jamison Road, Penrith) is located within the jurisdiction of Penrith City council. It is currently inhabited by a single storey brick residential building with a detached garage, which is located in the North-Eastern corner (rear) of the property. The subject site is prone to flooding due to upstream overland flow. **Figure 1** below is a map of the subject site and the surrounding areas and demonstrates the approximate direction in which the land falls and suggests the nature of the flow of rain water. **Figure 2** shows an extract from the Council's contour map which was used to determine the nature of the flow of flood waters upstream and through the subject site.

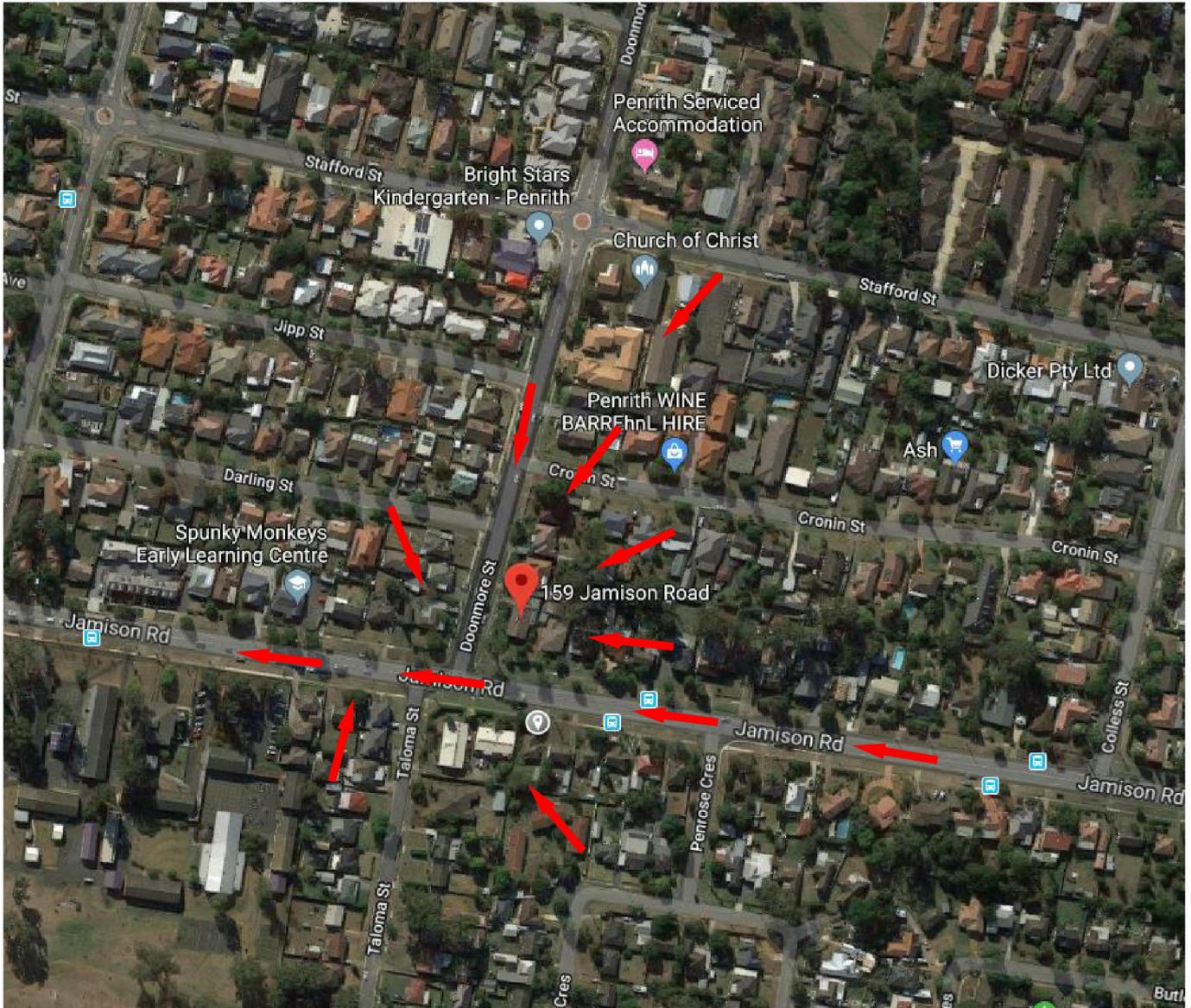


Figure 1: Site location

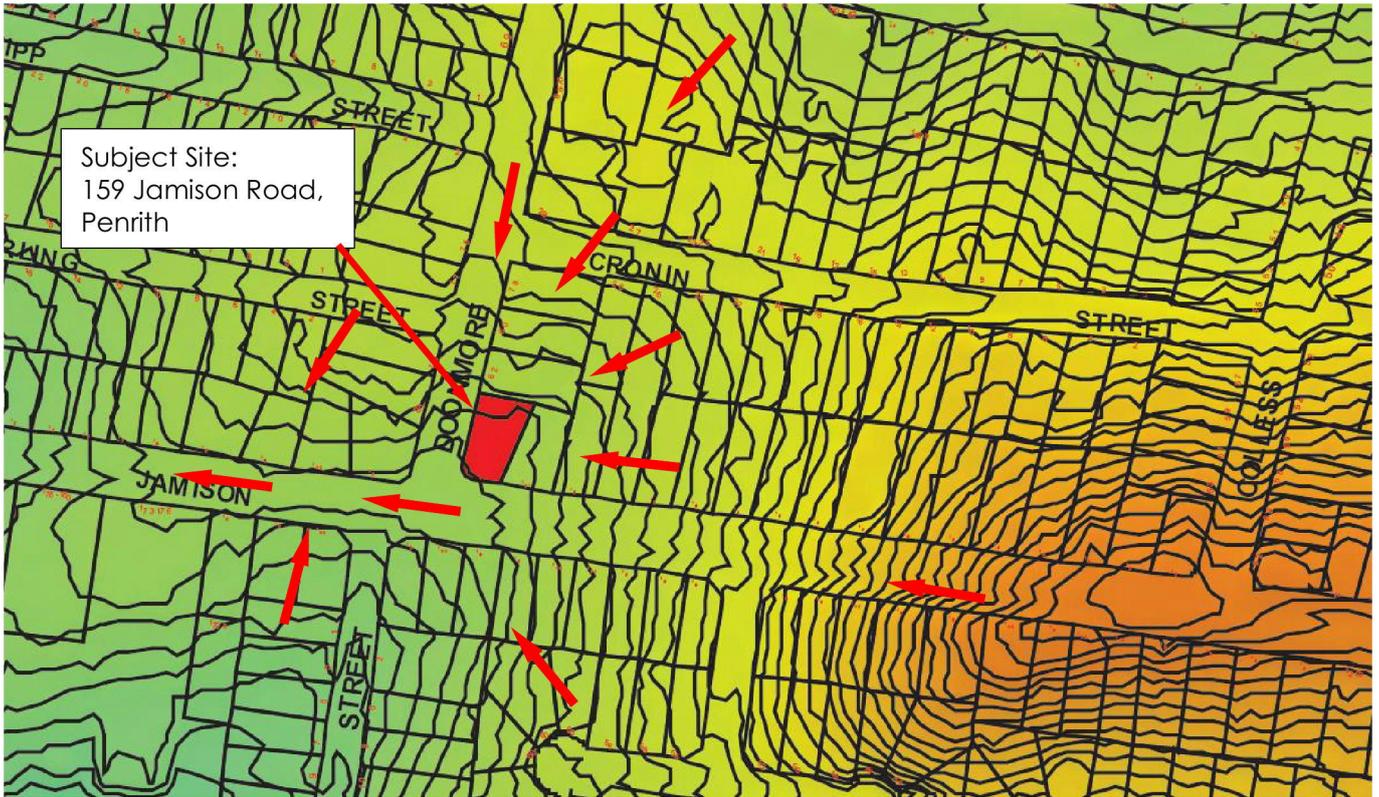


Figure 2: Extract of Penrith Council's Contour Map

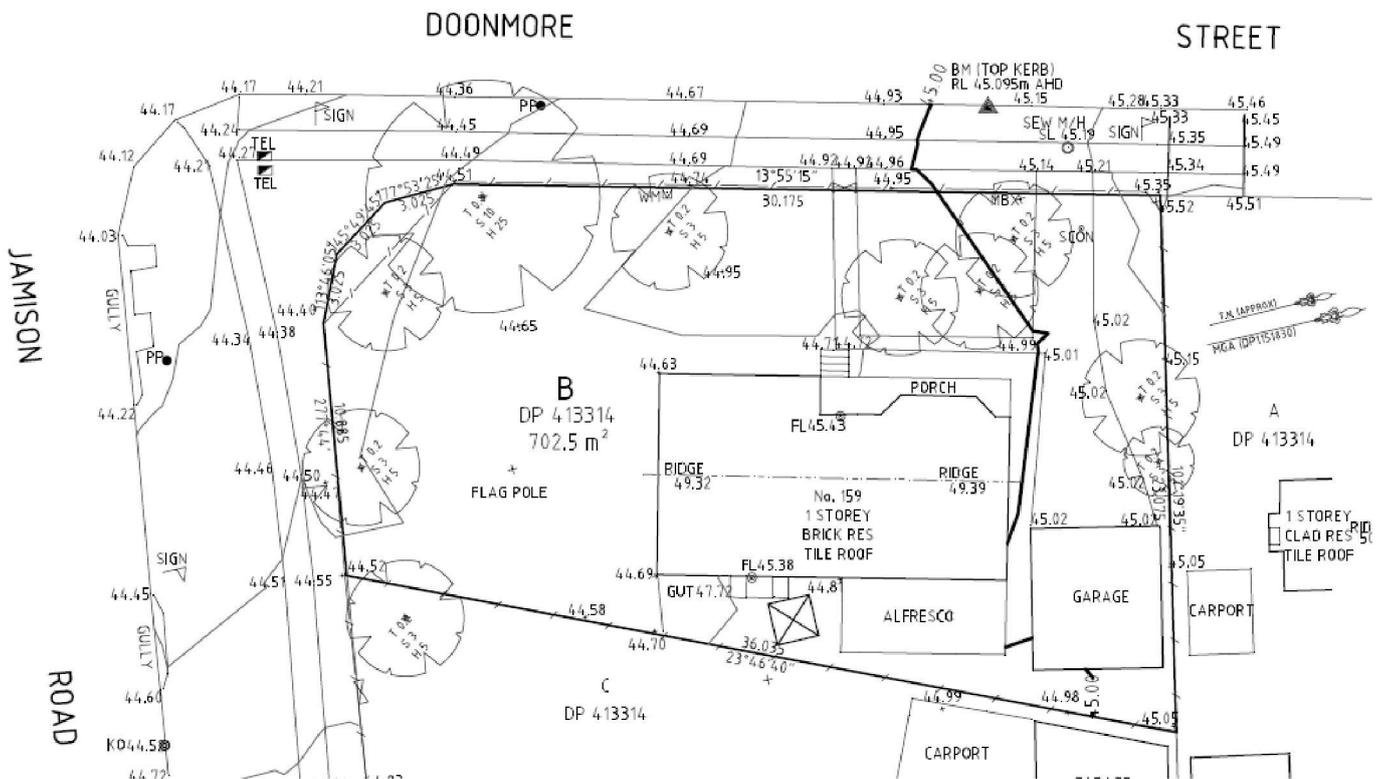


Figure 3: Subject Site Survey

Figure 4 below is an extract of the flood map from the Flood Information (Appendix H for full document) provided by Penrith Council, dated 9th of November 2018. It shows the approximate extent of the pre-development flooding conditions of the subject site. The flood information also suggests that the existing flood level at the North-Eastern boundary is approximately RL 45.40m AHD.



Figure 4: Flood Information provided by Penrith City Council (see **Appendix H** for full document)

3 PROPOSED DEVELOPMENT

The proposed development is described as a two-storey boarding house development. **Figure 5** below shows the proposed ground floor plan and Figure 6 shows the proposed basement plan of the development.



Figure 5: Ground Floor Plan of Proposed Development

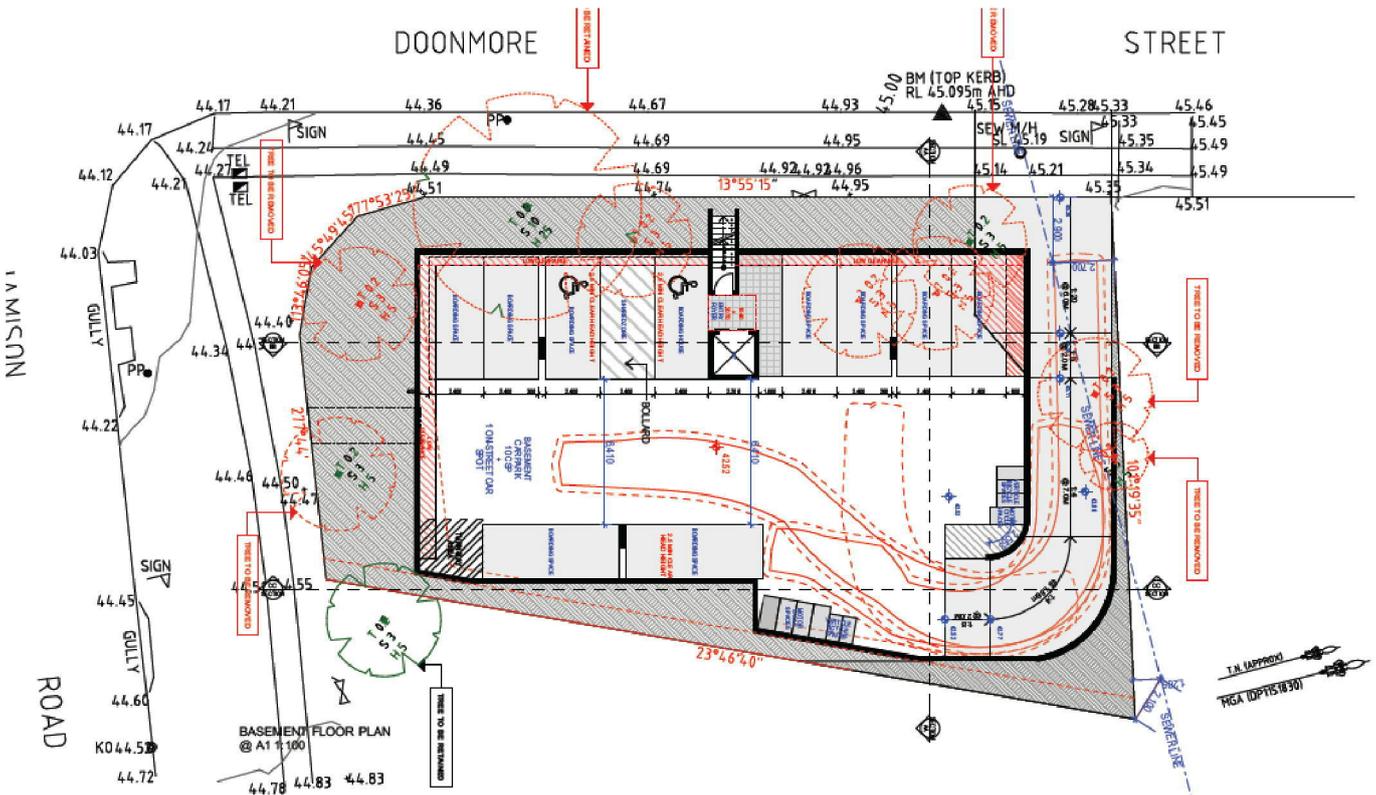


Figure 6: Basement Level Plan of Proposed Development

4 FLOOD STUDY

4.1 METHODOLOGY

The following methodology has been adopted to undertake the flood study, which is based on the Council's requirements on modelling drainage systems for flooding and reporting.

- Use the survey plan and available topographical map to establish the catchment/s area/s that will contribute to the overland flooding and flow running through the subject site.
- Use current satellite imagery to establish approximate pervious and impervious area ratio within the catchment area
- Use DRAINS modelling software to simulate a 1% AEP rainfall event and determine the maximum flow rate that is generated at the boundary of the subject site
- Utilise detailed survey of development site and catchment map (provided by Council) to construct detailed HEC-RAS model (land profile and obstructions)
- Input determined flowrate into the HEC-RAS model and known flood level at upstream boundary to determine flood levels throughout the subject site for the 1:100yr ARI storm event
- Utilise determined flood levels to set habitable and non-habitable finished planning levels (Flood level + Freeboard = Minimum. Planning level)

4.2 CATCHMENT ANALYSIS

The subject site is known to be affected by overland flooding which is mostly generated from the properties upstream. To gain a thorough understanding of the extent of the flooding, a catchment area was nominated. The catchment area was determined during a desktop investigation using the available survey plan, council's catchment map and available online information such as google street view. The catchment area was measured to be approximately 3.14 ha. Using an average sample of local properties, it was determined that the ratio between impervious and pervious area was approximately 40:60 respectively.

A summary of the catchment characteristics, which will be used for hydrological modelling and analysis is as below:

- Catchment area: 3.14 ha approx.
- Average slope: 5.6%
- Percentage of developed area: 40%
- Percentage of undeveloped area: 60%



Figure 7: Catchment Area as drawn on SIX MAPS

4.3 Modelling Assumptions

The modelling assumptions can be distinguished in to two (2) key components being hydrological and hydraulic. The hydrological component addresses assumptions related to the generation of the storm flow runoff, whilst the hydraulic component addresses assumptions related to how the determined flow acts within the pit & pipe network or channel/street.

The following assumptions were then made in order to run the HEC RAS hydraulic model in line with the Council's policies and Stormwater Code, NSW floodplain development manual and best practice guidelines on flood modelling.

4.3.1 Hydrological

The hydrological component of the flood study was carried out using the ILSAX method in the rainfall modelling software DRAINS. The time of concentration was determined using the rainfall intensity for the subject site, which was determined from the Bureau of Meteorology (BOM). The catchment data determined in the previous section was also used in this calculation sheet. Using this data, the total catchment flow rate was determined and assumed to run through the subject site. The flow rate determined was 1.417 m³/s. Refer to **Figure 8** below for the calculation spread sheet.

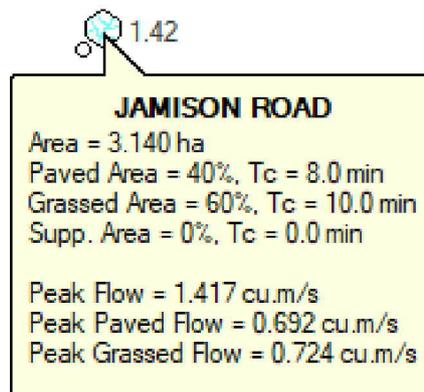


Figure 8: DRAINS modelling screenshot of the Catchment area.

4.3.2 Hydraulic

The hydraulic assumptions for the HEC-RAS model are as follows and based on a combination of Council nominated values and engineering judgement.

4.3.2.1 Catchment Hydraulic Analysis:

When determining the overland flowrate which contributes to the flooding on the subject site, it is important to consider the inlet pits and pipes which may exist within the flow path. Information on the location of pits and pipes has been provided by Penrith Council. From this information, it can be seen that there are no pits or pipes within the pathway of the overland flow and therefore the full flow rate that was previously established in the DRAINS model was used.

Table 1 below summarises the basic information of the catchment which contributes to the flooding that exists on site.

Catchment 1 Summary	
Area (ha)	3.14
Impervious area (%)	40
Pervious area (%)	60
Existing Pipe diameter (mm)	0 (No Pipe)
Total Runoff (m3/s)	1.417
50% Pipe Capacity (m3/s)	0 (No Pipe)
Overland Flow (m3/s)	1.417

Table 1: Catchment model details

4.3.2.2 HEC-RAS Model:

The river stations for the HEC-RAS model were located in areas where the surface was mostly grassed and obstructed by solid objects such as houses and fences. For this reason, the manning's "n" value was 0.05.

The fencing of the existing property is currently of picket type fencing that is solid and in reality, does not let water pass through. However, as a conservative measure, the HEC-RAS pre-development model assumes that the fencing is open styled.

Figures 9 and 10 shows the River Stations (cross-sections) across the subject site and the neighbouring properties.

Following modelling inputs/assumptions were made during HEC-RAS modelling:

- No obstructions are present within the road reserve i.e. cars, trees etc.
- Boundary Conditions
 - Upstream Boundary Condition: Known Water Surface = 45.40m AHD
 - Downstream Boundary Condition: Normal Depth
- Contraction Coefficient: 0.1; and
- Expansion Coefficient: 0.3.
- $Q_{\text{Overland Flow}} = 1.417\text{m}^3/\text{s}$

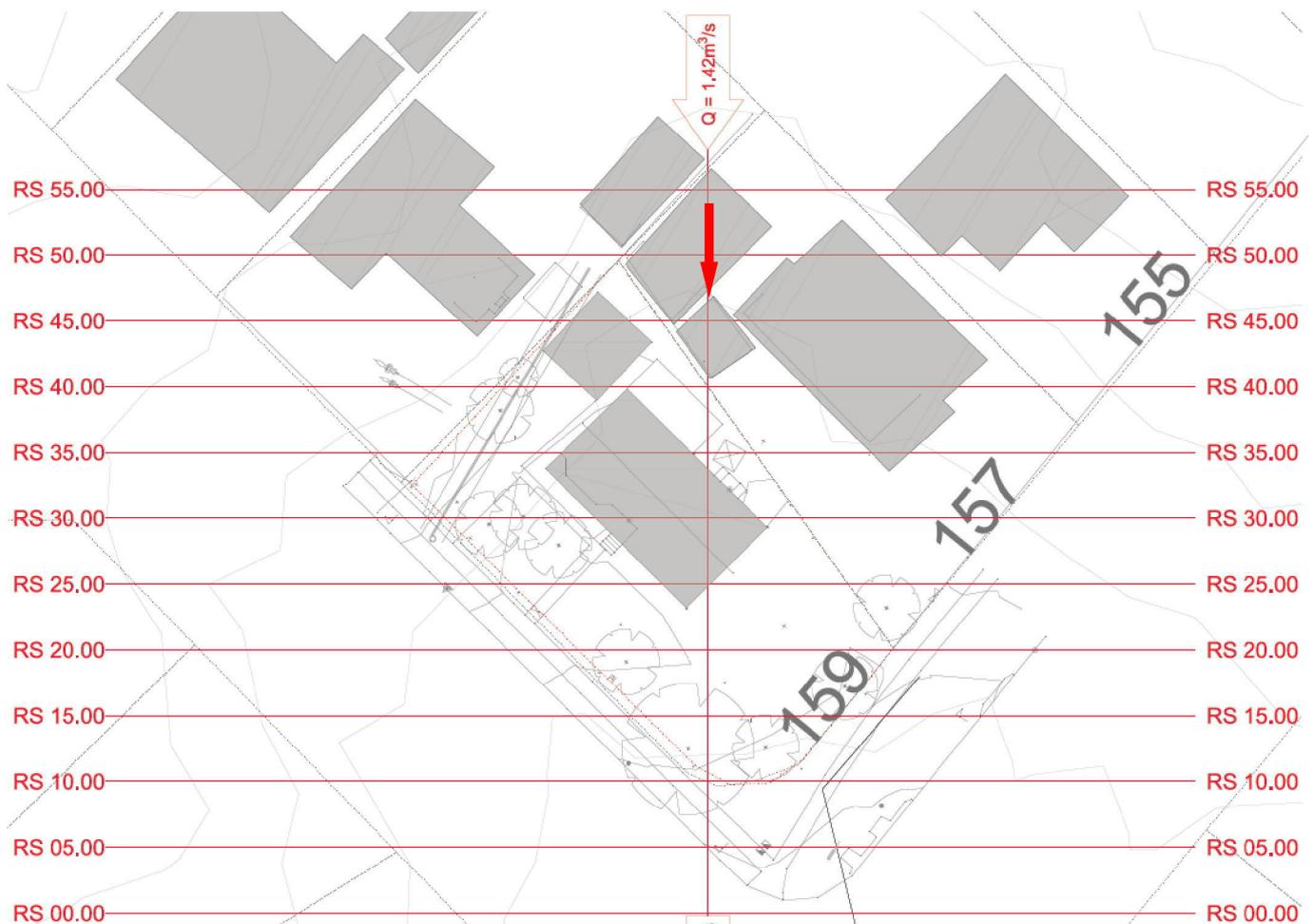


Figure 9: River Stations shown for Pre-Development Conditions

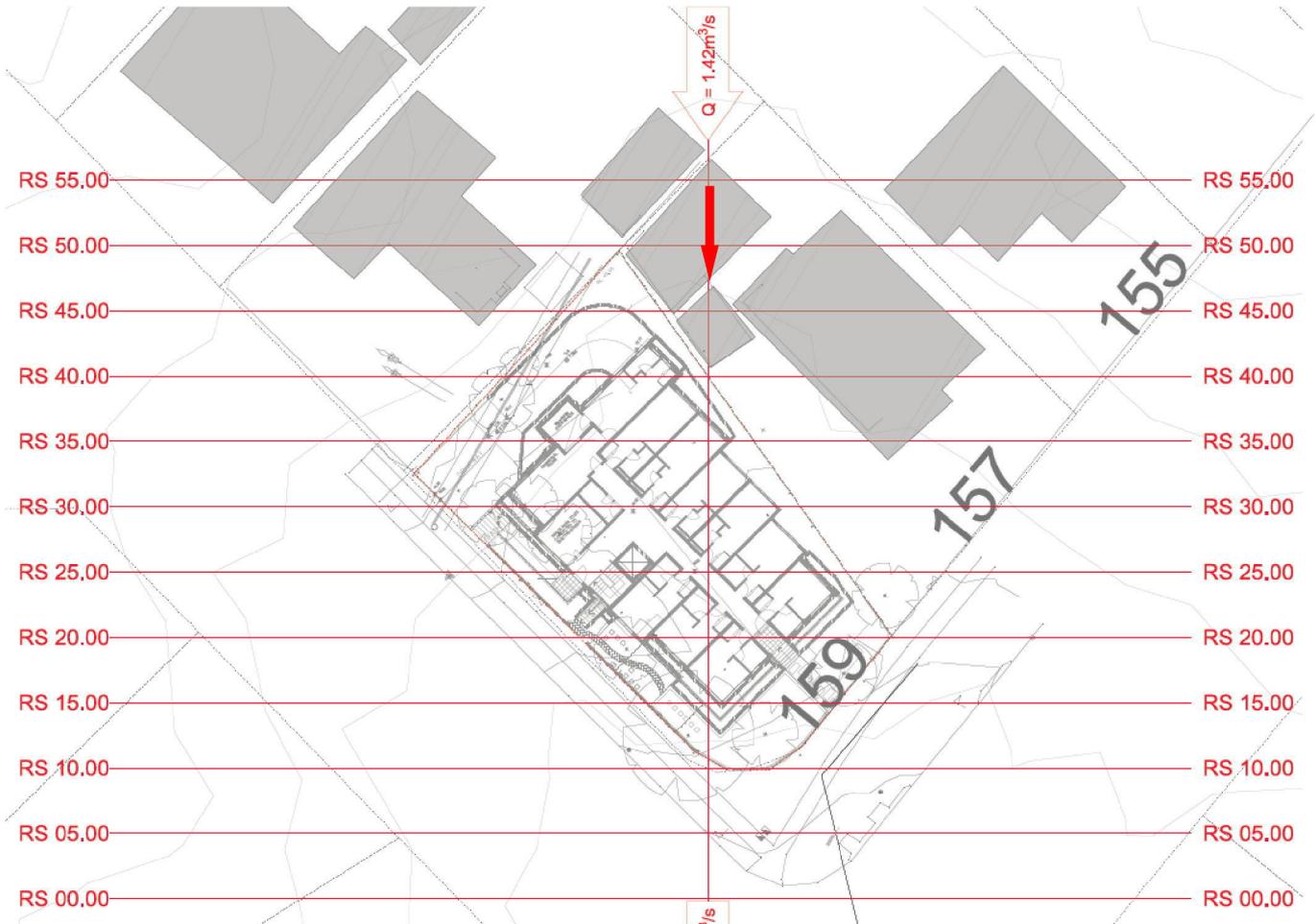


Figure 10: River Stations shown for Post-Development Conditions

5 FLOOD MODEL

5.1 Model Establishment

The HEC-RAS model was established on the basis of the site survey and available topographical map in order to determine the theoretical 100-year ARI water levels for the proposed development. A comparison between the pre and post-development modelling of the overland flow determines the impact that the proposed development may have on the flow rate, depth and velocity of the overland flow regime.

The upstream boundary condition has been calibrated to the flood level as shown on the flood information provided by the council. The water surface level is 45.40m AHD.

The result of the HEC-RAS modelling will help establish a safe Flood Planning Level based on the 1% AEP Flood level (500m freeboard). Also, the modelling work will help in interpreting the flood hazard in order to ensure safety to humans and the integrity of developed structures.

Figures 9 and 10 above shows the position of the cross-sections used to generate the computer model of the overland flow of the subject catchment area pre and post development (respectively).

Applying standard convention, the most down-stream river station has been labelled RS 00.00 and the most upstream has been labelled RS 55.00. Each River station has been taken at a 5-metre interval.

Specific site survey information was used to establish the HEC-RAS cross sections across at the subject property. For other adjoining properties, the contours provided on the available topographical map were used to help establish the general profile of the land.

5.2 Modelling Outputs

Modelling Outputs for the HEC-RAS model are located in **Appendix E, F and G**. These outputs include the following:

- HEC-RAS pre and post development flooding scenarios
- HEC-RAS cross sections with flood level shown;
- HEC-RAS output table of reach;

6 FLOOD IMPACT ANALYSIS RESULTS

6.1 Discussion on impact

During any development in a flood prone area, it is important to consider the impacts of the proposed development on the existing flood conditions. In most cases, the proposed development has a larger footprint than the existing condition. This means that there are larger obstructions in the path of the overland flow which can result in an increase in the flood extent, increase in the flood level and an increase in the flood hazard categories. If any of these indicators increase in a major way, it suggests that the proposed development has implications on the flood conditions and can cause problems for neighbouring and downstream properties.

In order to maintain the condition of the flooding for the subject site, a swale has been proposed on the Eastern side boundary to collect the overland flow from the upstream catchment area. The dimensions of the swale are to be 900mm wide (top width), 250mm deep (height) and the 400mm wide for the base (bottom width). The dimensions and the capacity of the swale are summarised in **Figure 11** below.

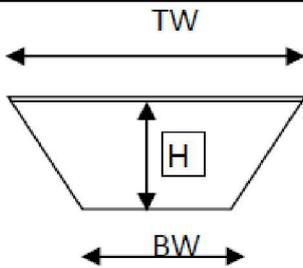
		Proposed Swale		
		TW	BW	H
	Size =	0.9	0.4	0.25
	Hydraulic Radius (Rh) =	0.147 m ² /m		
	Area =	0.1625 m ²		
	Slope =	1.5 %		
	n =	0.035		
Capacity Q =	158.22	l/s	V*d =	0.243

Figure 11: Pre-Development Flood Extent

These indicators can be seen in the **Figures 12 to 16** and **Table 2**.

Figures 12, 13 and 14 show the pre-development, post-development and comparison in the flood extent (respectively). From these figures, it can be seen that the proposed development does not have major implications on the existing extent of flooding. In-fact, due to the swale, the flood extent on the 157 Jamison Road, Penrith has reduced.

6.2 Discussion on Flood Hazard

Figures 15 and 16 show the pre and post development hydraulic hazard mapping. From the pre-development mapping, it is clear that the extent of the flooding remains within the low hazard category. Generally, the flood hazard category remains similar to the pre-development condition. However, the average hazard ratings between RS 45.00 to RS 20.00 are found to be increased as compared to pre-development conditions as seen from **Table 2** below. The increase in the hazard rating is expected due to the introduction of swale along the eastern boundary of the subject site. To clarify the increase in hazard ratings, Flood Hazard maps were produced as seen in Figure 15 and 16. From the post development hazard map, it is clear that the increased hazard rating is mainly within the swale area due to increase in depth of flow and velocity, while the hazard outside the swale is low. As such, the post development flood hazard is similar in neighbouring property. Therefore, this hazard increase is justifiable and acceptable for this development.

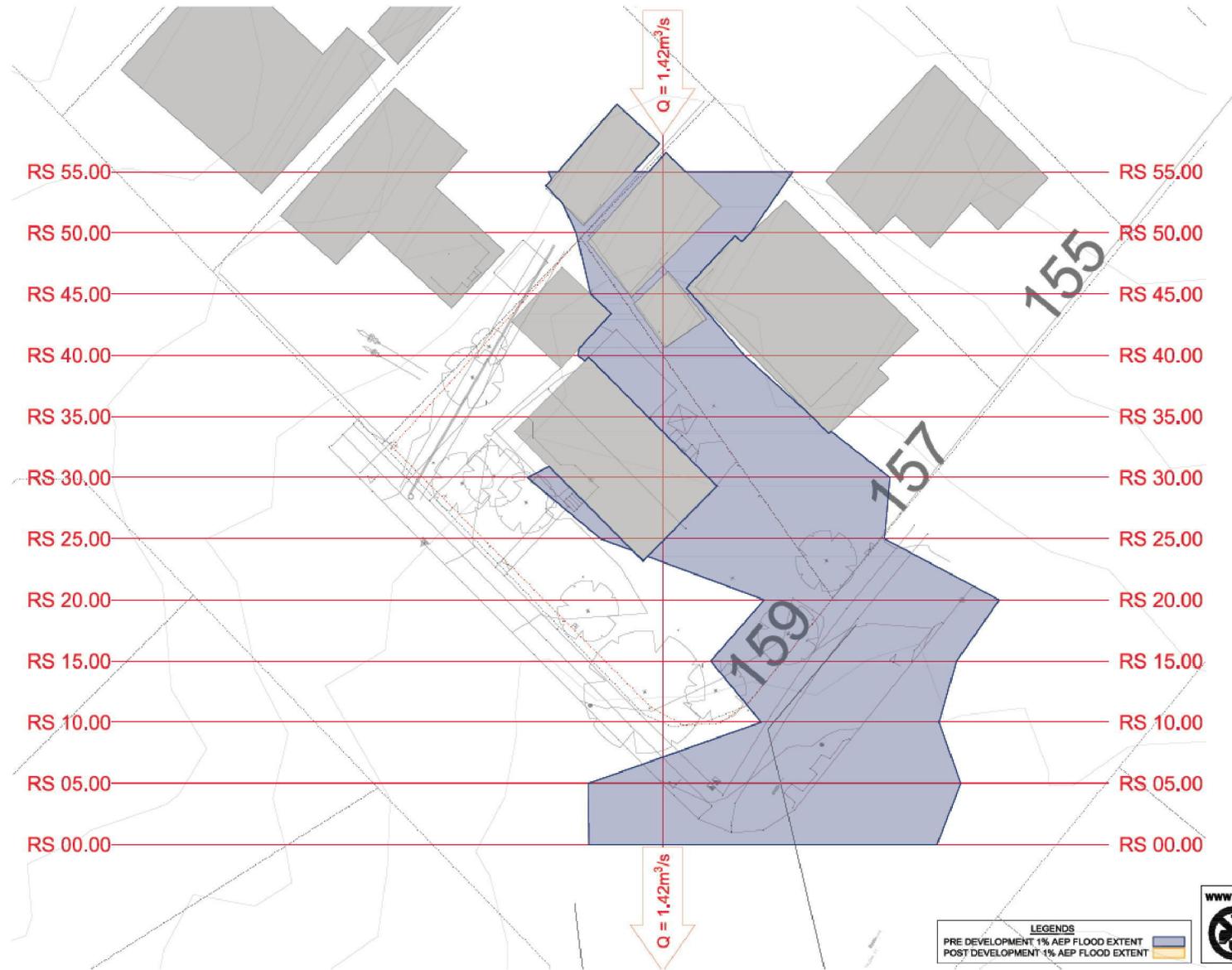


Figure 12: Pre-Development Flood Extent

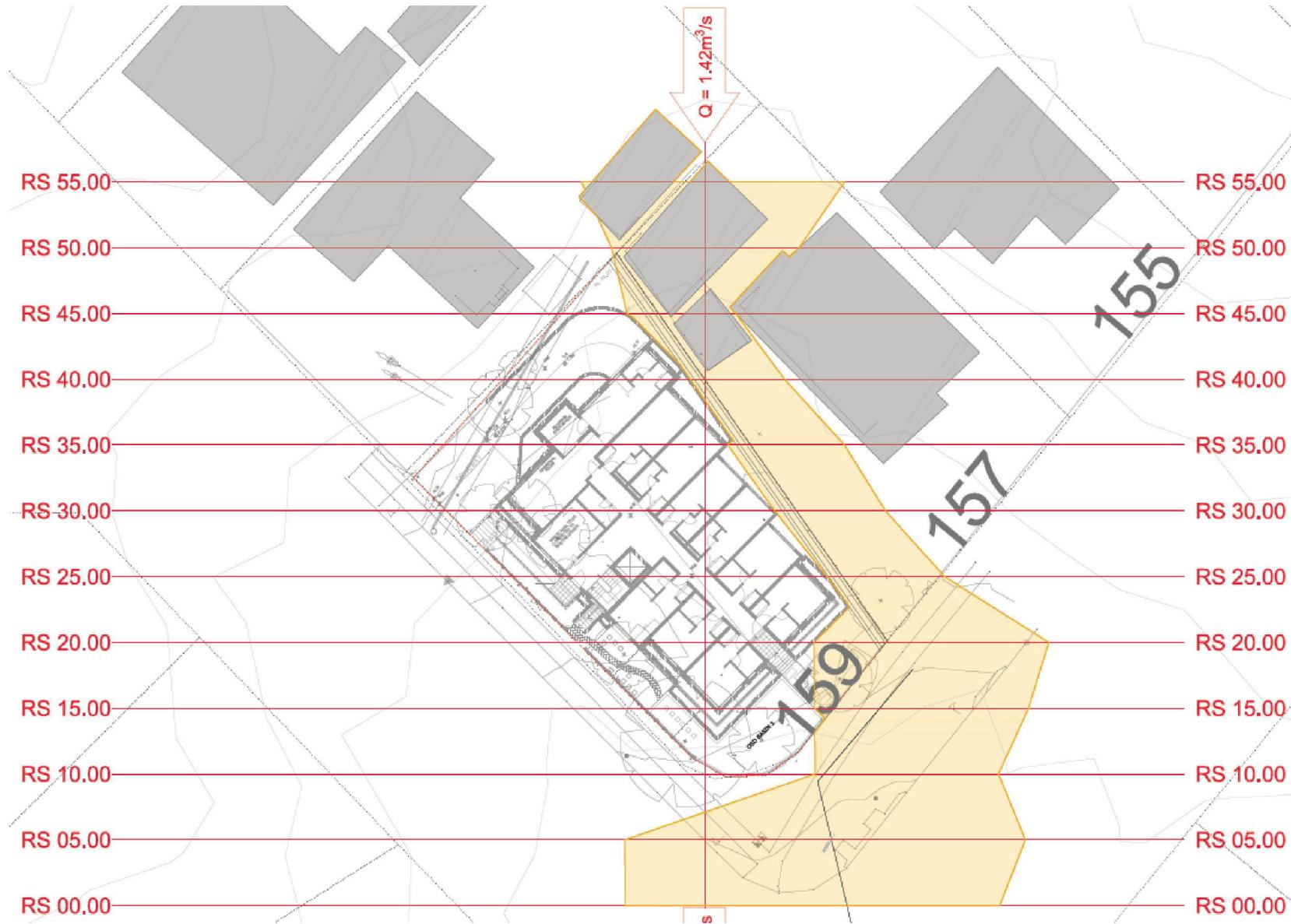


Figure 13: Post Development Flood Extent

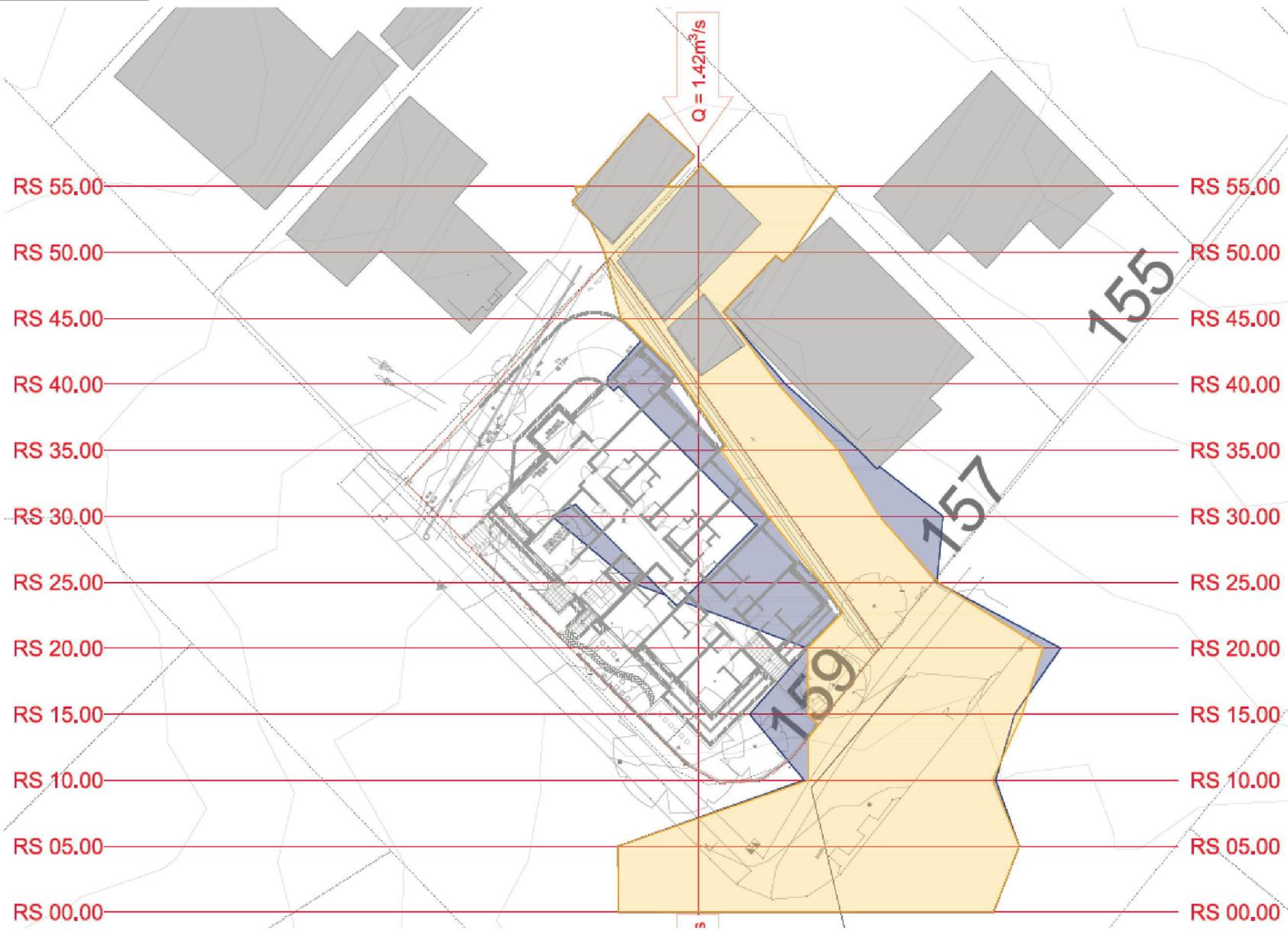


Figure 14: Pre vs Post Development Flood Extent

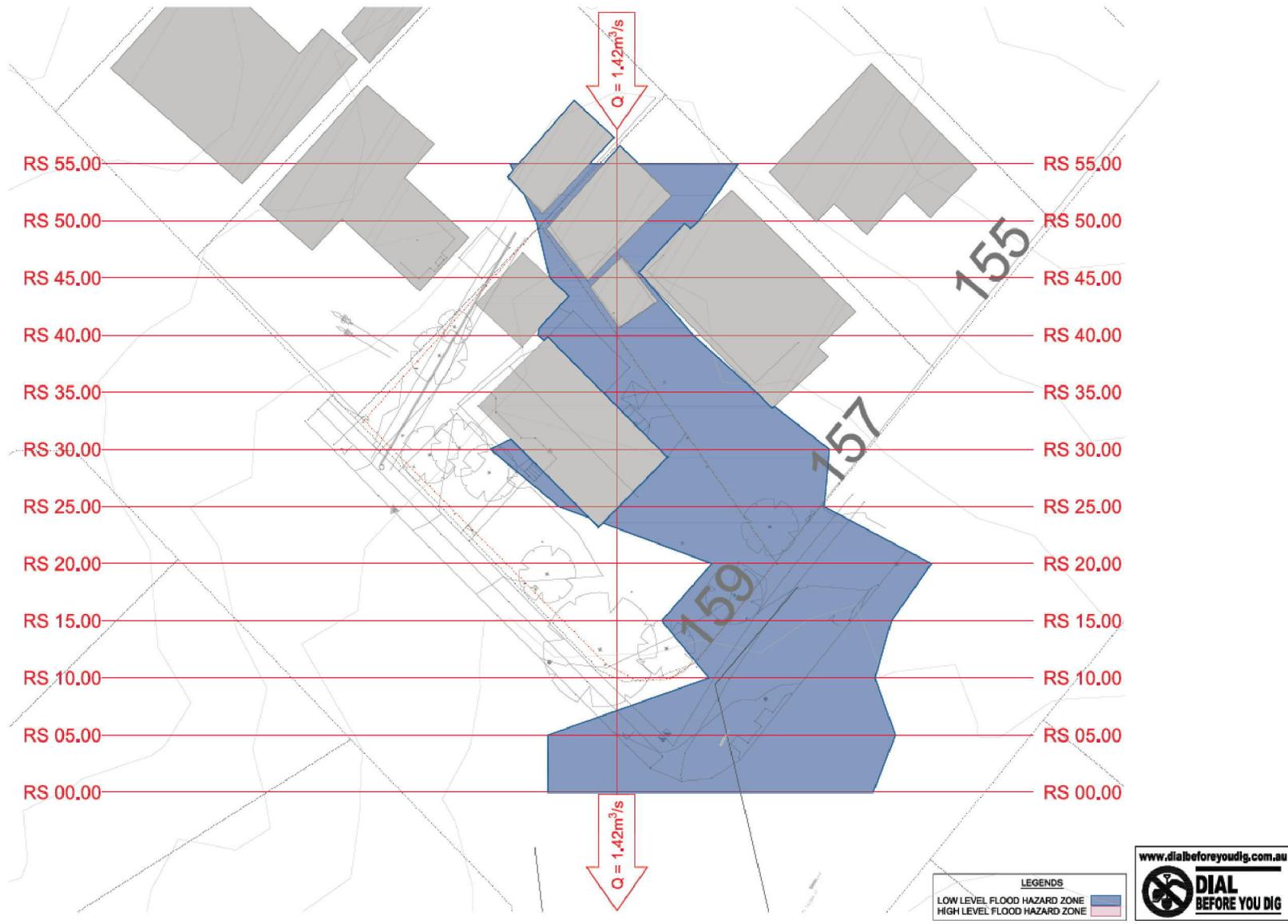


Figure 15: Pre-Development Hydraulic Hazard Mapping

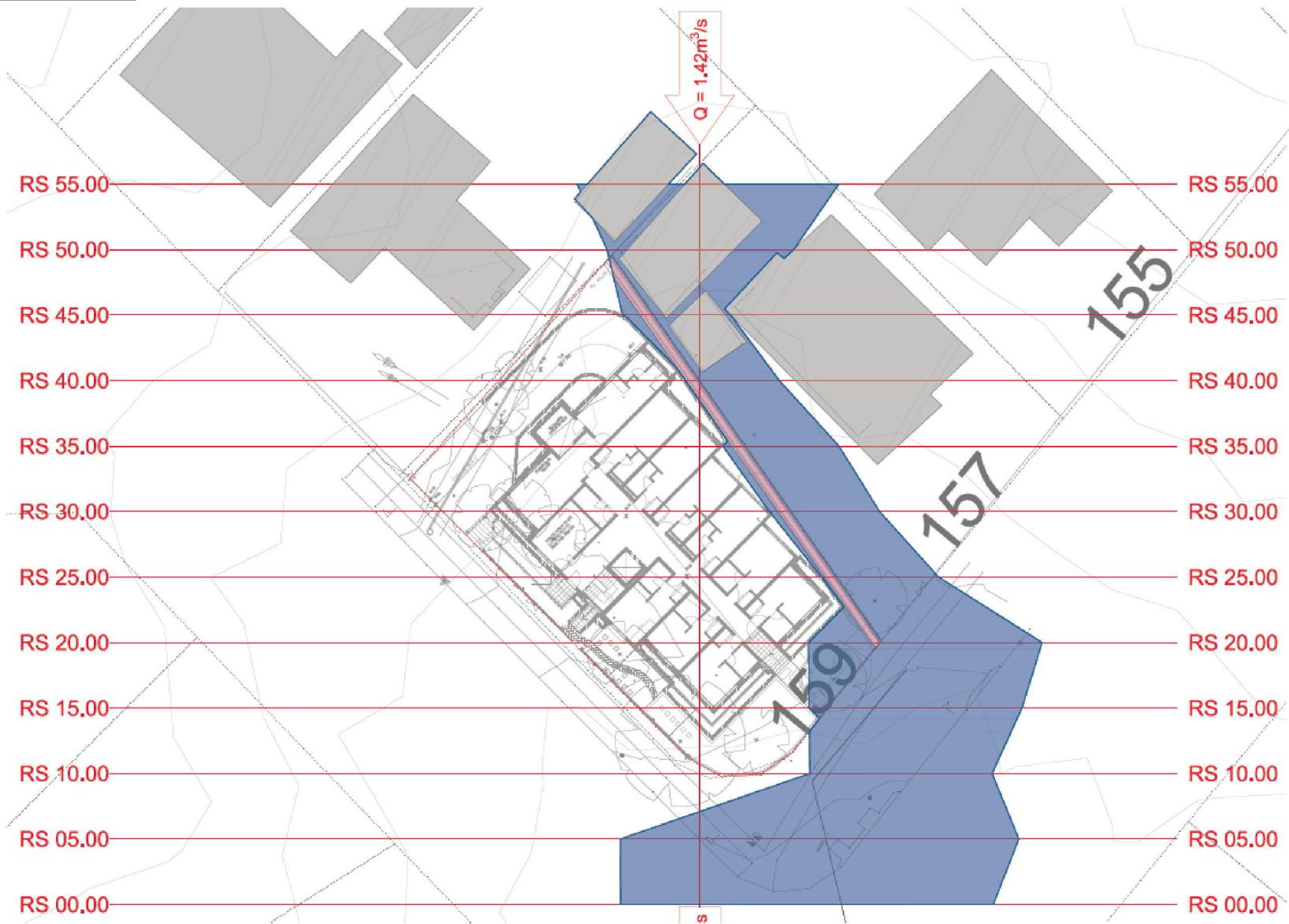


Figure 16: Post-Development Hydraulic Hazard Mapping

Reach	RS	Profile	Plan	Q Total (m3/s)	W.S. Elev (m)	E.G. Elev (m)	E.G. Slope (m/m)	Max Chl Dpth (m)	Vel Chnl (m/s)	Hydraulic Hazard (D x V)	Hazard Category (FDM)	Hazard Category (ARR Guidelines 2016)	Flow Area (m2)	Top Width (m)
1	55	PF 1	PRE DEV	1.42	45.55	45.61	0.004975	0.24	1.09	0.2616	LOW	H1	1.3	10.89
1	55	PF 1	POST	1.42	45.55	45.61	0.004975	0.24	1.09	0.2616	LOW	H1	1.3	10.89
1	50	PF 1	PRE DEV	1.42	45.37	45.56	0.014574	0.2	1.9	0.38	LOW	H1	0.75	6.15
1	50	PF 1	POST	1.42	45.37	45.56	0.014574	0.2	1.9	0.38	LOW	H1	0.75	6.15
1	45	PF 1	PRE DEV	1.42	45.13	45.45	0.026482	0.13	2.5	0.325	LOW	H5	0.57	4.34
1	45	PF 1	POST	1.42	45.06	45.43	0.033277	0.33	2.72	0.8976	HIGH	H5	0.52	4.34
1	40	PF 1	PRE DEV	1.42	44.98	45.23	0.066159	0.09	2.22	0.1998	LOW	H5	0.64	13.68
1	40	PF 1	POST	1.42	44.98	45.23	0.03272	0.35	2.18	0.763	HIGH	H5	0.65	8.18
1	35	PF 1	PRE DEV	1.42	44.95	45.05	0.014891	0.14	1.42	0.1988	LOW	H1	1	13.53
1	35	PF 1	POST	1.42	44.9	45.07	0.020674	0.36	1.84	0.6624	HIGH	H1	0.77	8.9
1	30	PF 1	PRE DEV	1.42	44.94	44.99	0.005858	0.19	0.96	0.1824	LOW	H1	1.47	17.67
1	30	PF 1	POST	1.42	44.83	44.98	0.01541	0.37	1.71	0.6327	HIGH	H2	0.83	8.48
1	25	PF 1	PRE DEV	1.42	44.76	44.92	0.046866	0.09	1.73	0.1557	LOW	H1	0.82	19.76
1	25	PF 1	POST	1.42	44.73	44.89	0.018355	0.37	1.77	0.6549	HIGH	H1	0.8	9.01
1	20	PF 1	PRE DEV	1.42	44.62	44.73	0.025948	0.1	1.46	0.146	LOW	H1	0.97	19.37
1	20	PF 1	POST	1.42	44.58	44.75	0.050835	0.31	1.83	0.5673	HIGH	H4	0.77	17.97
1	15	PF 1	PRE DEV	1.42	44.56	44.63	0.013975	0.1	1.19	0.119	LOW	H1	1.19	20.25
1	15	PF 1	POST	1.42	44.57	44.63	0.007736	0.11	1.08	0.1188	LOW	H1	1.31	16.39
1	10	PF 1	PRE DEV	1.42	44.36	44.52	0.032318	0.11	1.75	0.1925	LOW	H1	0.81	14.64
1	10	PF 1	POST	1.42	44.36	44.54	0.040286	0.11	1.9	0.209	LOW	H1	0.75	14.05
1	5	PF 1	PRE DEV	1.42	44.35	44.35	0.000322	0.25	0.33	0.0825	LOW	H1	4.36	30.67
1	5	PF 1	POST	1.42	44.35	44.35	0.000322	0.25	0.33	0.0825	LOW	H1	4.36	30.67
1	0	PF 1	PRE DEV	1.42	44.31	44.35	0.005684	0.13	0.79	0.1027	LOW	H1	1.79	28.68
1	0	PF 1	POST	1.42	44.31	44.35	0.005684	0.13	0.79	0.1027	LOW	H1	1.79	28.68

Table 2:100 Year ARI Flood Impact Analysis (Comparison table from HEC-RAS)

6.3 Conclusion

Therefore, the development will have minimal impact of flooding to the subject site and neighbouring properties. In fact, the proposed development will improve the flooding affectation. Although the proposed building has a larger footprint than the pre-development structures, the implementation of the 900mm wide swale has ensured that the flooding behaviour on the neighbouring properties does not increase.

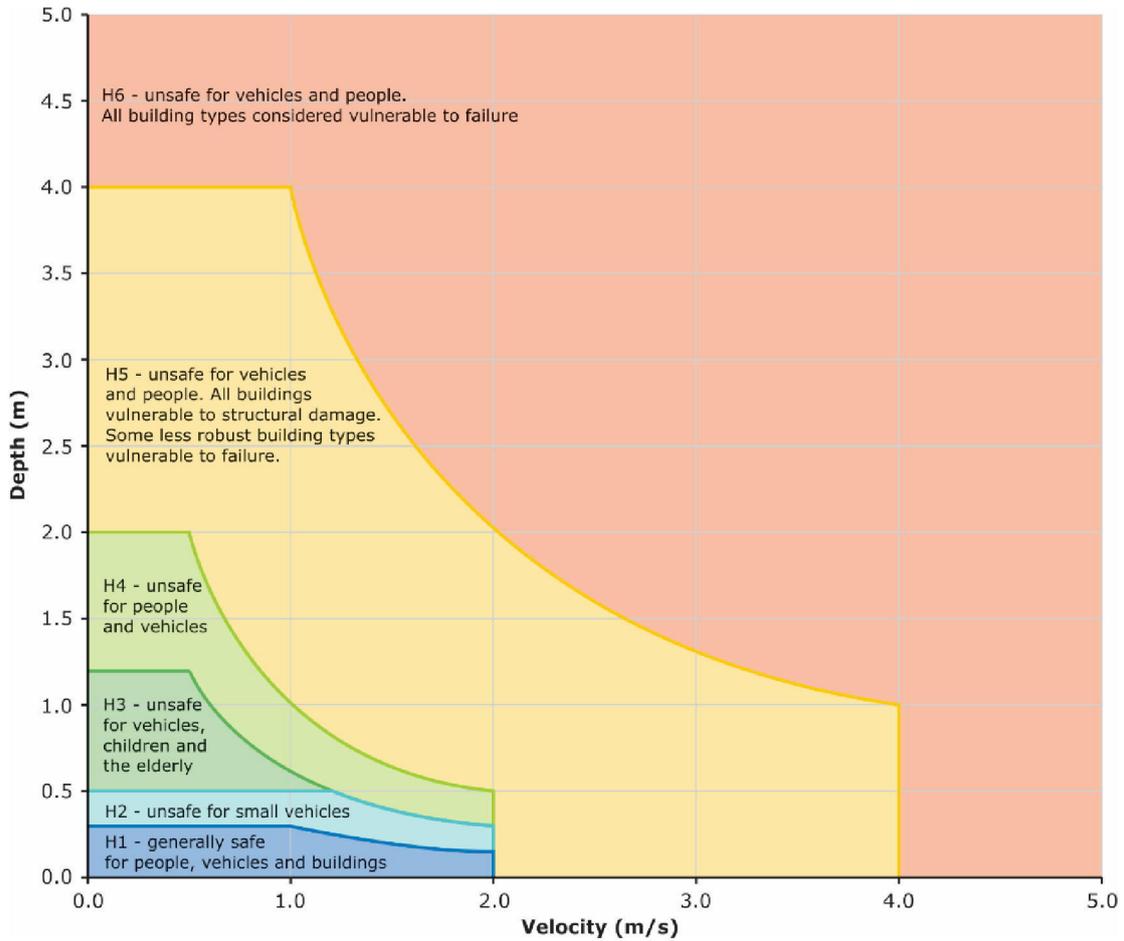


Figure 17: Flood Hazard Category Curves extracted from the Australian Rainfall and Runoff Guidelines of 2016 (ARR 2016)

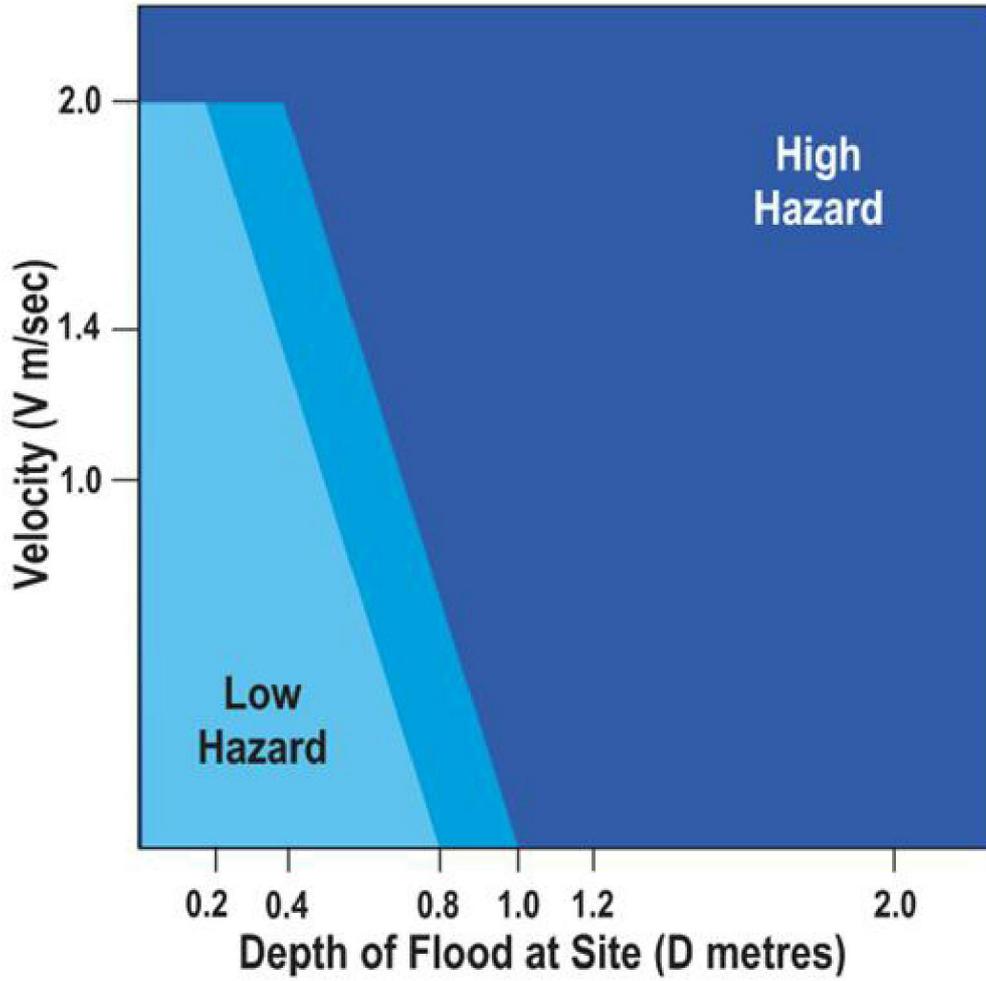


Figure 18: Flood Hazard Graph extracted from the Flood Development Manual (FDM)

7 FLOOD RISK PLANNING CONSIDERATION

The objective of this report is to determine the overland flow characteristics and review the impact that the proposed development will have on the existing drainage infrastructure and surrounding properties and address council flood control requirements.

7.1 Floor Level

Habitable floor level to be higher than the 1% AEP flood level plus 500mm freeboard. From flood modelling:

Proposed development	River Station	Flood Level (AHD)	Freeboard (metres)	Min – Finish Floor Level (AHD)	Proposed Floor Level (AHD)
Driveway Crest	45.00	45.06	0.30	45.36	45.36
Driveway Wall	45.00	45.06	0.50	45.56	--
Internal (Upstream)	40.00	44.98	0.50	45.48	45.50
Internal (Downstream)	30.00	44.83	0.50	45.33	45.50

Table 3: Proposed Minimum Finish Floor Level

Finished floor levels are to be adopted as shown in **Table 3** above. The minimum levels have been obtained using the flood level at the closest upstream river station and adding the freeboard to it. Finished floor levels that are higher than the minimum suggested levels are also acceptable.

7.2 Building Components and Method

All structures of this dwelling shall be flood compatible building components. The finished floor levels of the habitable areas of this development shall be built to a minimum of 500mm above the 100 Year ARI flood level. The non-habitable areas of this development shall be built to a minimum of 100mm above the 100 Year ARI flood level.

7.3 Structural Soundness

Structural engineers report is required to certify that the structure can withstand the forces of floodwater debris and buoyancy up to and including a 1% AEP flood level plus 500mm freeboard (refer to Council's DCP).

7.4 Flood Effects

The subject site has been affected by flooding from 1% AEP event. From the pre and post flood modelling flood comparison, it can be seen that the flood levels generally remain the same or made better with the exception of River Station 15 which has increased by 10mm which is acceptable. The post-development flood extent remains the within the pre-development extent which is also acceptable. The flood hazard classification increases from LOW to HIGH between RS 45.00 to RS 20.00. As mentioned before, the hazard classification is directly proportional to the depth of the flooding. Therefore, the increase in the hazard classification is predominantly due to the increased depth of the proposed swale and does not extend into the neighbouring properties.

7.5 Car parking and driveway access

There is a driveway ramp which leads to a basement carpark for this proposed development. To ensure that the flood waters does not enter the basement, it is essential to incorporate a raised driveway crest which is a minimum of 300mm above the flood level. The flood level at the ramp is expected to be approximately 45.06m AHD and therefore the driveway crest must be a minimum of RL 45.36m AHD.

7.6 Evacuation

It is recommended that during any flood event, all persons should stay within the building. The internal floor level will be a minimum of 500mm higher than the 1% AEP flooding event and therefore should not be able to cause harm to humans. Should the flood waters reach the level of the driveway crest, all persons should move to the upper floor levels.



Figure 19: Typical boundary fencing



Figure 20: Typical boundary fencing



8 APPENDICES

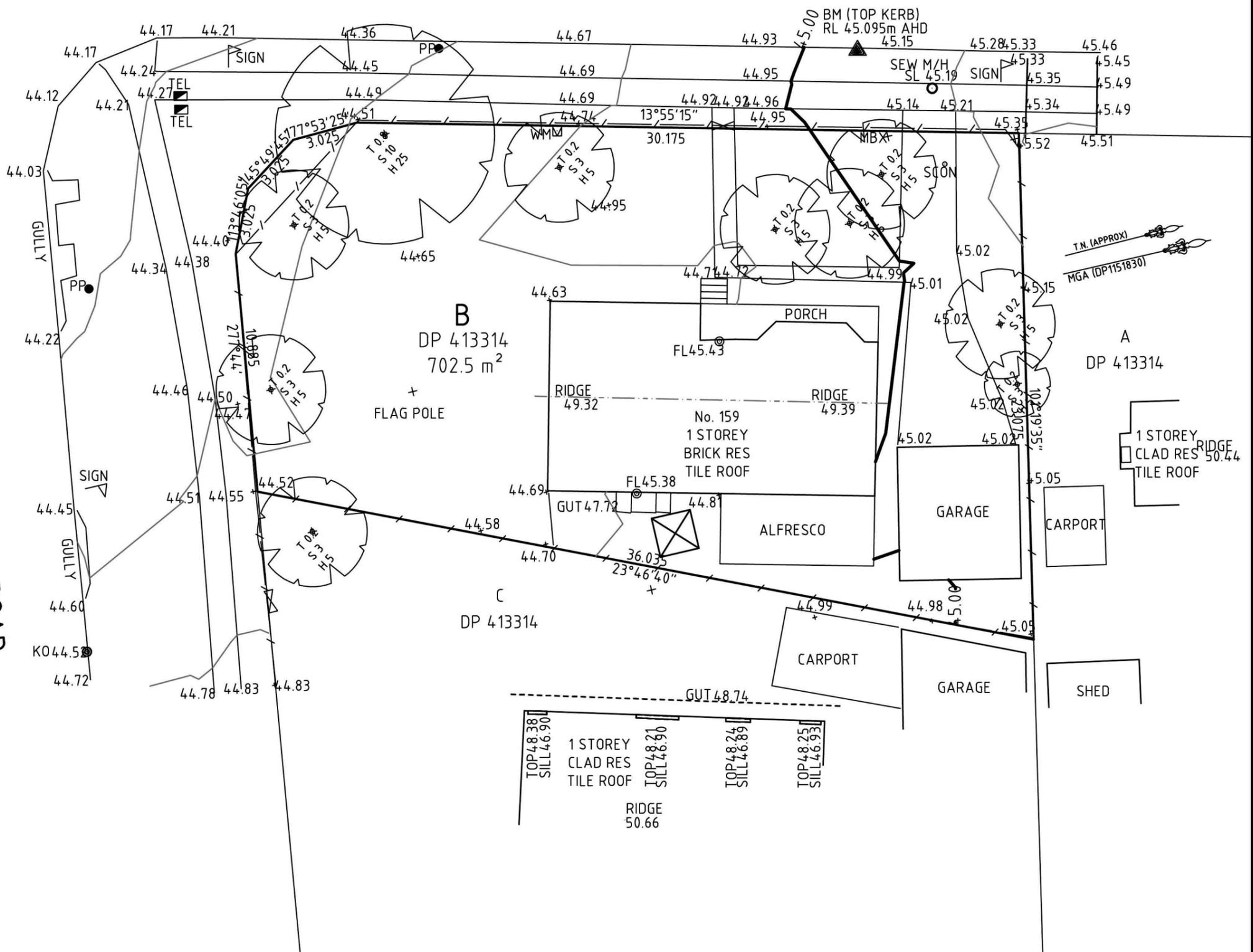
Appendix	Title
Appendix A	Site Survey
Appendix B	Architectural Plans
Appendix C	Pre and Post 1% AEP Flood Extents
Appendix D	Hydraulic Flood Hazard Mapping
Appendix E	Pre-Development HEC RAS River Station Sections
Appendix F	Post-Development HEC RAS River Station Sections
Appendix G	Flood Calculations Summary Table
Appendix H	Flood Information provided by Penrith City Council
Appendix I	Catchment Map provided by Penrith City Council

DOONMORE

STREET

JAMISON

ROAD



NOTE:

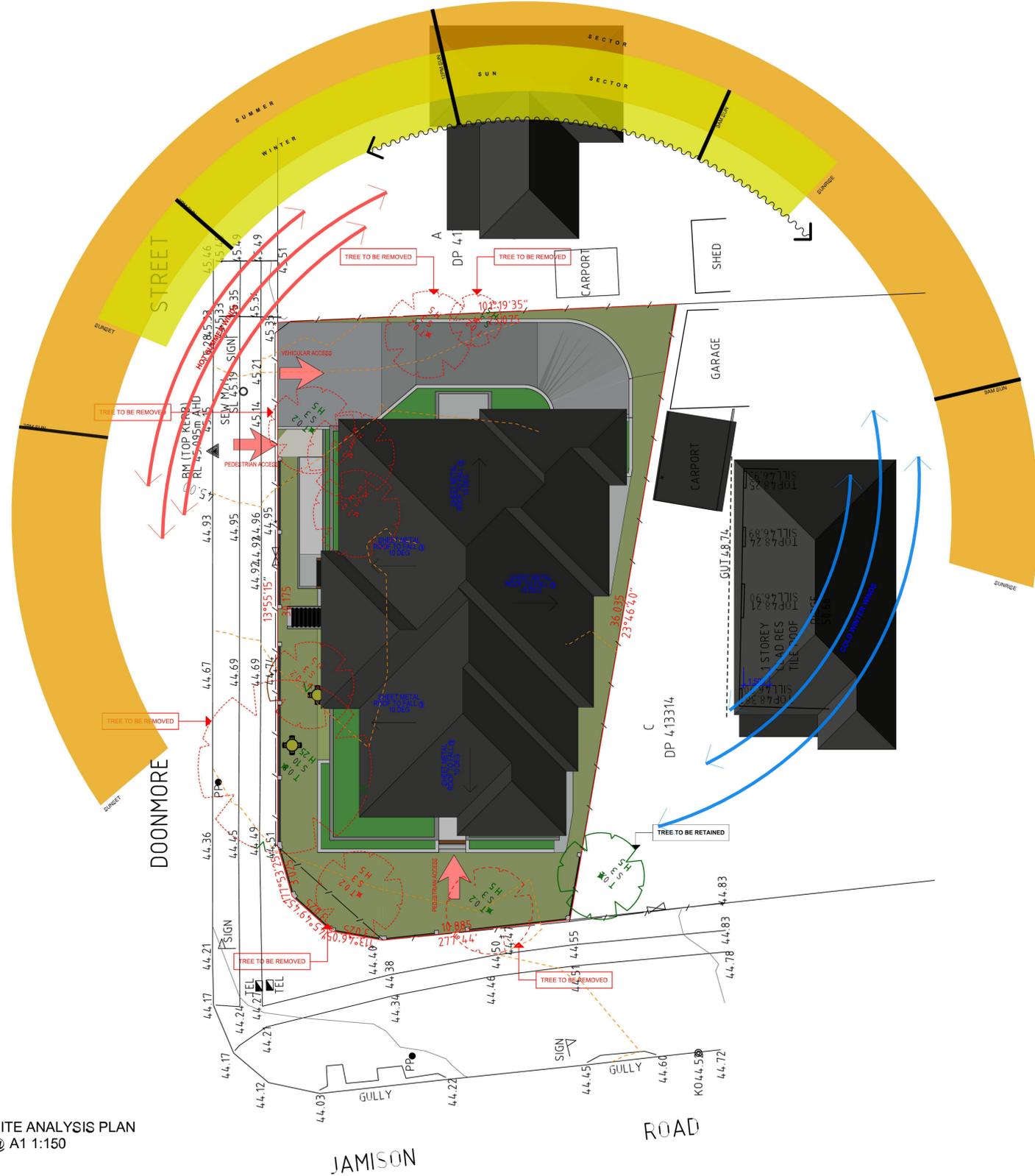
- THIS SURVEY IS FOR THE PURPOSE OF DESIGNING NEW IMPROVEMENTS UPON THE LAND AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
- BOUNDARIES ARE APPROXIMATE ONLY AND HAVE NOT BEEN SURVEYED OR INVESTIGATED, TITLE DIMENSIONS AND AREA SHOWN.
- ONLY SURFACE SERVICES EVIDENT AT THE TIME OF FIELD SURVEY ARE SHOWN. UNDERGROUND UTILITIES SEARCH WAS NOT CONDUCTED. RELEVANT AUTHORITIES SHOULD BE CONTACTED, PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION UPON THE LAND
- FEATURES SHOWN ARE DIAGRAMMATIC ONLY. FURTHER SURVEY MIGHT BE REQUIRED, WHERE POSITION IS DEEMED CRITICAL. DIAMETER, HEIGHT & SPREAD OF TREES ARE APPROXIMATE ONLY.

THIS NOTE FORMS AN INTEGRAL PART OF THIS PLAN.

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		CHECKED: ZTW								DRAWING No:		
		DATUM: AHD								190196 DE-01		
		ORIGIN OF LEVELS: PM 12623		1								
		CONTOUR INTERVAL: 0.2m										
		SCALE: 1:200										
1	13-10-2018	ORIGINAL ISSUE	TJS	ZTW								
Rev	DATE	REVISIONS	Drn	Chk								

PROPOSED BOARDING HOUSE DEVELOPMENT COMPRISING OF A 2 STOREY, 20 ROOMS + 1 MANAGER WITH ASSOCIATED BASEMENT PARKING @ 159 JAMISON RD, PENRITH FOR DEVELOPMENT APPLICATION

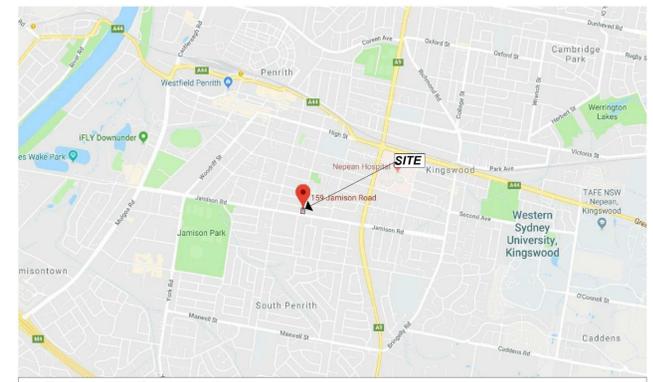


SITE ANALYSIS PLAN @ A1 1:150

GFA CALCULATION		SITE AREA = 702.5 m ²	
FSR = N/A	CALCULATION	GROUND	300m ²
FA = 261.75m ²	PROPOSED	LEVEL 1	284m ²
FSR = 0.83 :1		TOTAL	584.00m ²
603.00m ²			

TABLE OF COMPLIANCE				SITE AREA 447m ²			
SEPP ITEMS	REQUIREMENT	PROPOSED	COMPLY				
FSR	NA	0.83 : 1	YES				
BUILDING HEIGHT	8.5m	8.0m	YES				
COURTYARD MGR	2.5 X 2.5	2.5 X 2.5	YES				
LANDSCAPE	40% OR 231	40% OR 231	YES				
ROOM BREAKDOWN	SINGLE	DOUBLE	MGR	TOTAL			
GROUND	5	4	1	10			
FIRST	8	3	0	11			
					21	TOTAL ROOMS	
PARKING			PROV	RQD			
0.5 SPACE PER ROOM	20 X 0.5 = 10		11	11			
1 SPACE PER MGR	1 X 1 = 1						

REFER TO TRAFFIC REPORT



LOCATION MAP

DEVELOPMENT APPLICATION BOARDING HOUSE DEVELOPMENT 159 JAMISON RD, PENRITH

DRAWING INDEX

DA1001 - SITE ANALYSIS PLAN/ COVER

DA2001 - BASEMENT FLOOR
DA2002 - GROUND FLOOR
DA2003 - LEVEL 1
DA2004 - ROOF PLAN

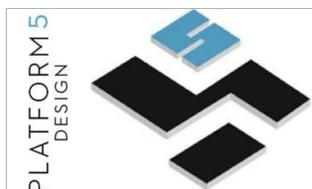
DA3001 - ELEVATIONS
DA3002 - SECTIONS

DA4001 - SHADOWS

VIEW ALONG CORNER OF JAMISON ROAD & DOONMORE STREET



VIEW ALONG DOONMORE STREET



REV	DESCRIPTION	DATE	REV	DESCRIPTION	DATE
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B	ISSUE FOR INFORMATION	18-03-19			
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F					

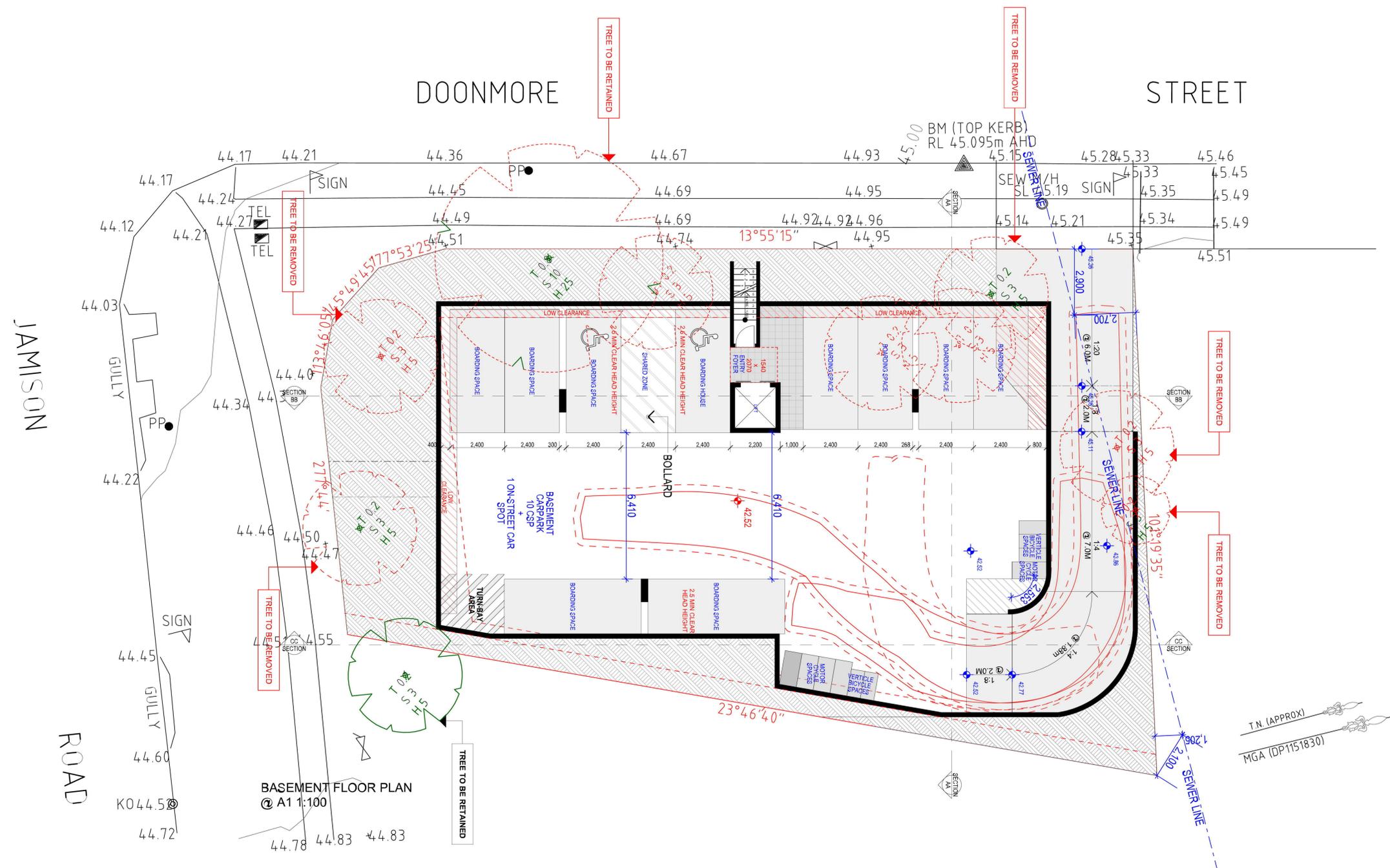
- 159 JAMISON RD - PENRITH - NSW - SYDNEY - DEVELOPMENT APPLICATION TWO STOREY BOARDING HOUSE DEVELOPMENT

1000 SITE PLAN
SITE / ANALYSIS PLAN
Designed
Approved

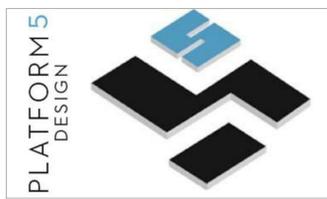
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Drawing Number 1001
Scale AS SHOWN
Date of Issue 19/03/2019
DEVELOPMENT APPLICATION ISSUE A

Assessor Certificate					
Issued in accordance with BASIX Thermal Comfort Simulation Method.					
Assessor No #	20851 Projects: PENRITH				
Thermal performance specifications					
Following specification must apply to all instances of that element for the whole project. If different construction elements are applied then the Assessor Certificate is no longer valid.					
Certificate No:	159 JAMISON RD				
External walls Construction	Added Insulation				
Brick Veneer (First floor)	R2.0				
Cavity Brick (Ground floor)	R1.5				
Internal walls Construction					
Party wall on studs (between units)	R1.5				
Single skin	R1.5				
Roof Construction					
Metal Roof	Foil				
Colour	Medium				
Ceilings Construction					
Plaster board	R3.0				
Floors Construction	Covering				
Concrete (above carpark)	As drawn R1.0				
Concrete (Floor between)	As drawn Nil				
Windows & Glazed door					
All window and glazed door to be selected as per AFRC. Deviation is accepted ±5%. This tolerance ONLY applies to SHGC, the U-value can always be lower but not higher than the values stated.					
Area (M ²)	Frame	Ext. cover	U Val	SHGC	Glazing
As drawn	Aluminium	As drawn	5.6	0.41	Single clear
Skylights					
Area (M ²)	Type				Glazing
As drawn	Nil				Nil
Fixed shading (leaves, pergolas, verandas, awnings)					
All shade elements modelled as drawn					
Weather seals to windows and doors			Be provided		
All down lights be sealed			Yes		

1Thermal Spec_159 JAMISON RD1



BASEMENT FLOOR PLAN
@ A1 1:100



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- 159 JAMISON RD -
- PENRITH -
- NSW - SYDNEY -
**DEVELOPMENT APPLICATION TWO STOREY BOARDING
HOUSE DEVELOPMENT**

2000 FLOOR PLANS
BASEMENT PLAN
Designed
Approved

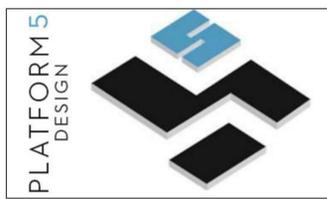
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Drawing Number 2001	Date of Issue 19/03/2019

DEVELOPMENT APPLICATION ISSUE A



Assessor Certificate					
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Projects:	PENRITH				
Thermal performance specifications					
Following specification must apply to all instances of that element for the whole project. If different construction elements are applied then the Assessor Certificate is no longer valid.					
Certificate No:	159 JAMISON RD				
External walls Construction					
Brick Veneer(First floor)	Added Insulation				
Cavity Brick (Ground floor)	R2.0				
Internal walls Construction					
Party wall on studs(between units)	R1.5				
Single skin	R1.5				
Roof Construction					
Metal Roof	Foil				
Colour	Medium				
Ceilings Construction					
Plaster board	R3.0				
Floors Construction					
Concrete (above carpark)	As drawn				
Concrete (Floor between)	As drawn				
Windows & Glazed door					
All window and glazed door to be selected as per AFRC. Deviation is accepted ±5% . This tolerance ONLY applies to SHGC, the U-value can always be lower but not higher than the values stated.					
Area(M²)	Frame	Ext. cover	U Val	SHGC	Glazing
As drawn	Aluminium	As drawn	5.6	0.41	Single clear
Skylights					
Area (M²)	Type	Glazing			
As drawn	Nil	Nil			
Fixed shading (eaves, pergolas, verandas , awnings)					
All shade elements modelled as drawn					
Weather seals to windows and doors					Be provided
All down lights be sealed					Yes

1Thermal Spec_159 JAMISON RD1



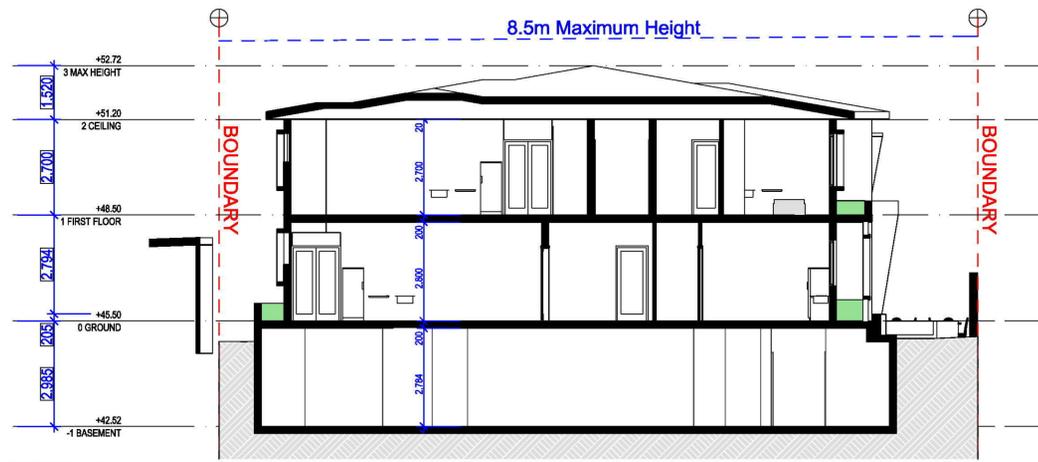
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- 159 JAMISON RD -
- PENRITH -
- NSW - SYDNEY -
**DEVELOPMENT APPLICATION TWO STOREY BOARDING
HOUSE DEVELOPMENT**

3000 ELEVATIONS
ELEVATIONS
Designed
Approved

Project Number 18-030	Scale AS SHOWN
Drawing Number 3001	Date of Issue 19/03/2019

DEVELOPMENT APPLICATION ISSUE A



SECTION A - A
@ A1 1:100



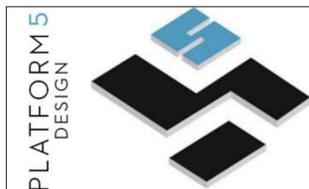
SECTION B - B
@ A1 1:100



SECTION C - C
@ A1 1:100

Assessor Certificate					
Issued in accordance with BASIX Thermal Comfort Simulation Method.					
Assessor No #	20851				
Projects:	PENRITH				
Thermal performance specifications					
<i>Following specification must apply to all instances of that element for the whole project. If different construction elements are applied then the Assessor Certificate is no longer valid.</i>					
Certificate No:	159 JAMISON RD				
External walls Construction	Added Insulation				
Brick Veneer (First floor)	R2.0				
Cavity Brick (Ground floor)	R1.5				
Internal walls Construction					
Party wall on studs (between units)	R1.5				
Single skin	R1.5				
Roof Construction					
Metal Roof	Foil				
Colour	Medium				
Ceilings Construction					
Plaster board	R3.0				
Floors Construction					
Concrete (above carpark)	As drawn				
Concrete (Floor between)	As drawn				
Concrete (Floor between)	As drawn				
Windows & Glazed door					
<i>All window and glazed door to be selected as per AFRC. Deviation is accepted ±5%. This tolerance ONLY applies to SHGC, the U-value can always be lower but not higher than the values stated.</i>					
Area (M ²)	Frame	Ext. cover	U Val	SHGC	Glazing
As drawn	Aluminium	As drawn	5.6	0.41	Single clear
Skylights					
Area (M ²)	Type	Glazing			
As drawn	Nil	Nil			
Fixed shading (leaves, pergolas, verandas, awnings)					
All shade elements modelled as drawn					
Weather seals to windows and doors	Be provided				
All down lights be sealed	Yes				

1Thermal Spec_159 JAMISON RD1



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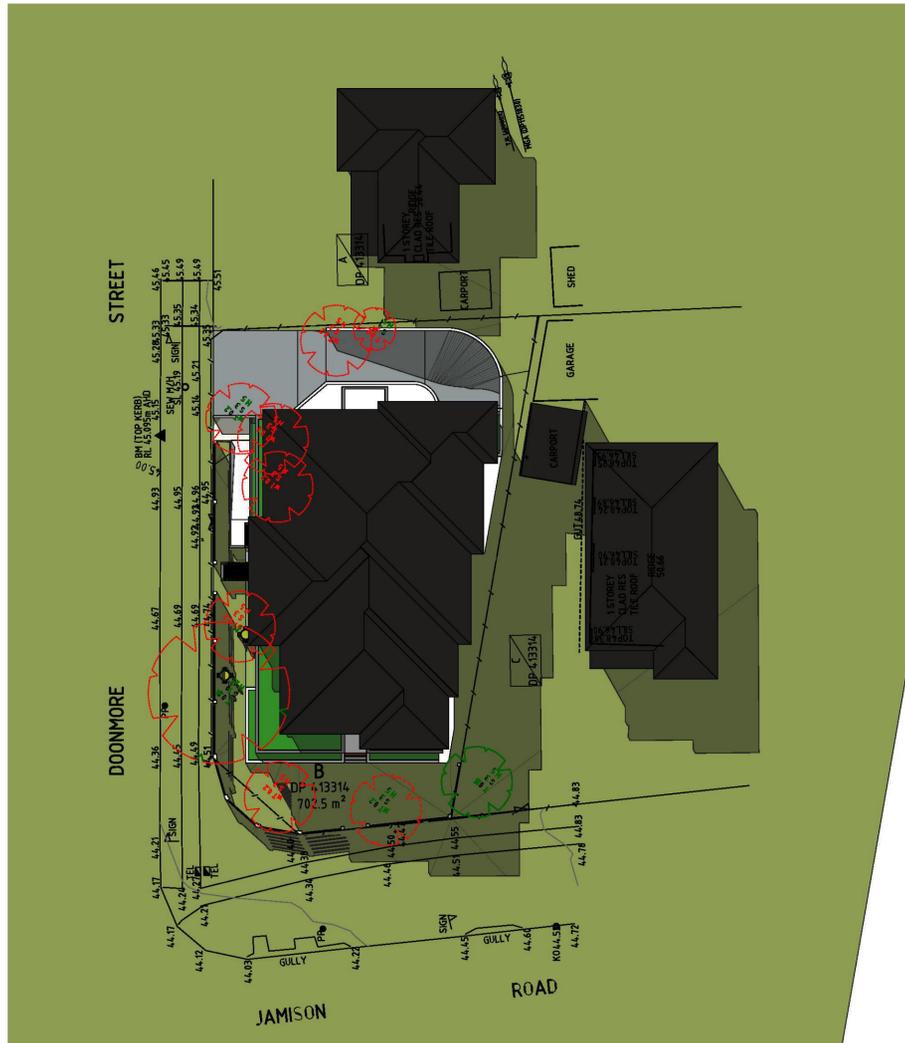
- 159 JAMISON RD -
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DEVELOPMENT APPLICATION TWO STOREY BOARDING
HOUSE DEVELOPMENT

3100 SECTIONS
SECTIONS
Designed
Approved

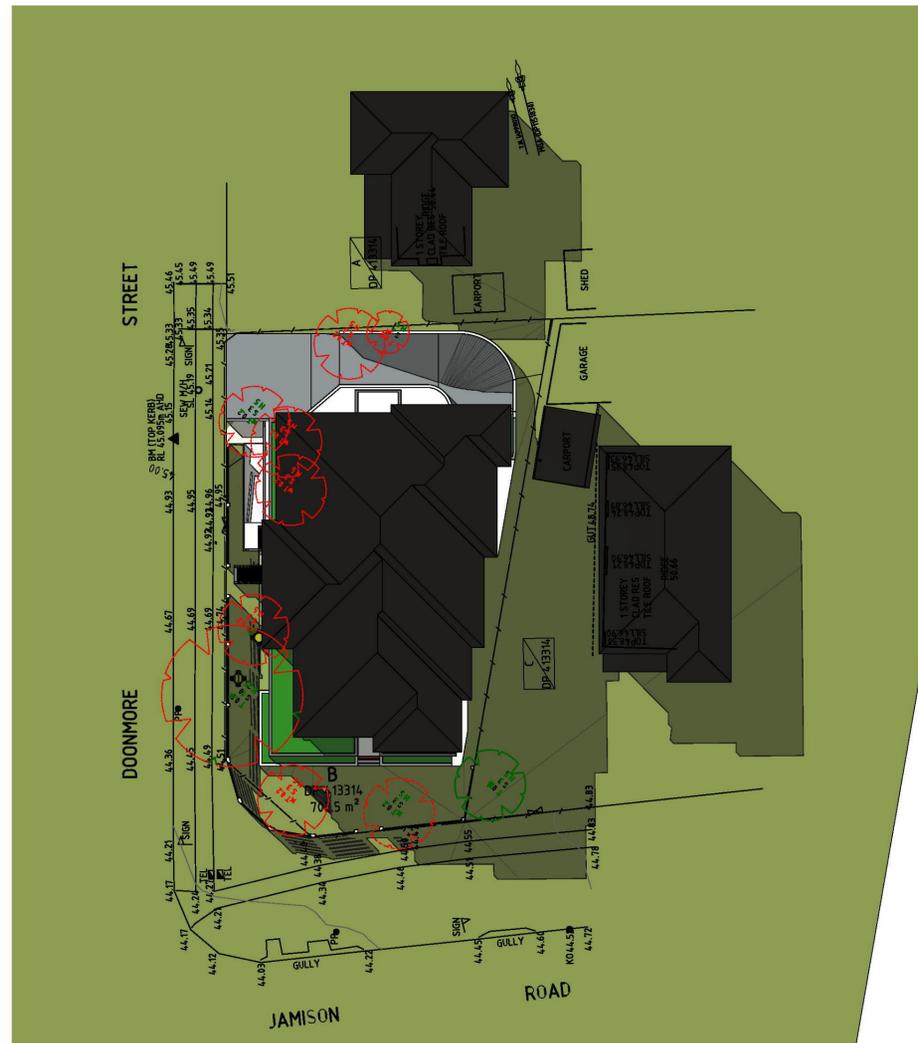
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18-030
Scale
AS SHOWN
Drawing Number
3001
Date of Issue
19/03/2019



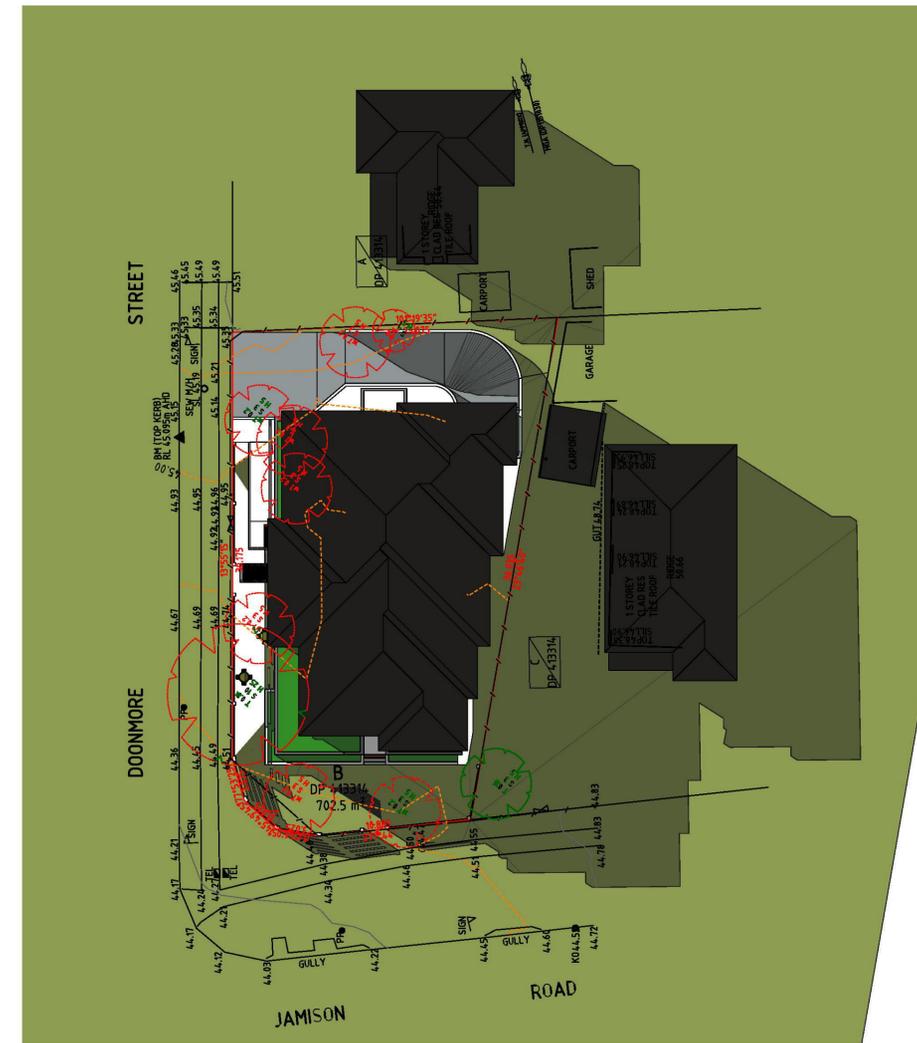
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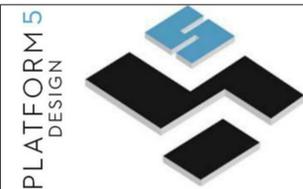
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1 JUNE 21ST, 3PM 1:250



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DEVELOPMENT APPLICATION TWO STOREY BOARDING
HOUSE DEVELOPMENT

3200 SHADOW DIAGRAMS
JUNE EQUINOX
 Designed
 Approved

Project Number
18-030
 Drawing Number
3201

Scale
AS SHOWN
 Date of Issue
19/03/2019



DEVELOPMENT APPLICATION ISSUE A



LEGENDS
 PRE DEVELOPMENT 1% AEP FLOOD EXTENT 
 POST DEVELOPMENT 1% AEP FLOOD EXTENT 

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REVISION	AMENDMENT	ISSUE DATE
A	FLOOD EXTENT	06-02-2019



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PROJECT
**PROPOSED DEVELOPMENT
 159 JAMISON ROAD,
 PENRITH**

DRAWING TITLE		
PRE DEVELOPMENT 1% AEP FLOOD EXTENT		
SCALES AS SHOWN	DESIGNED RP	DRAFTED RP
DRAWING NO. A8388 - FS01	APPROVED JM	REVISION A

Document Set ID: 8644726
Version: 1, Version Date: 04/04/2019



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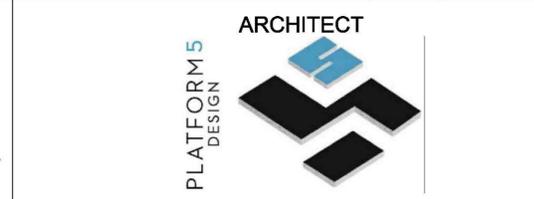
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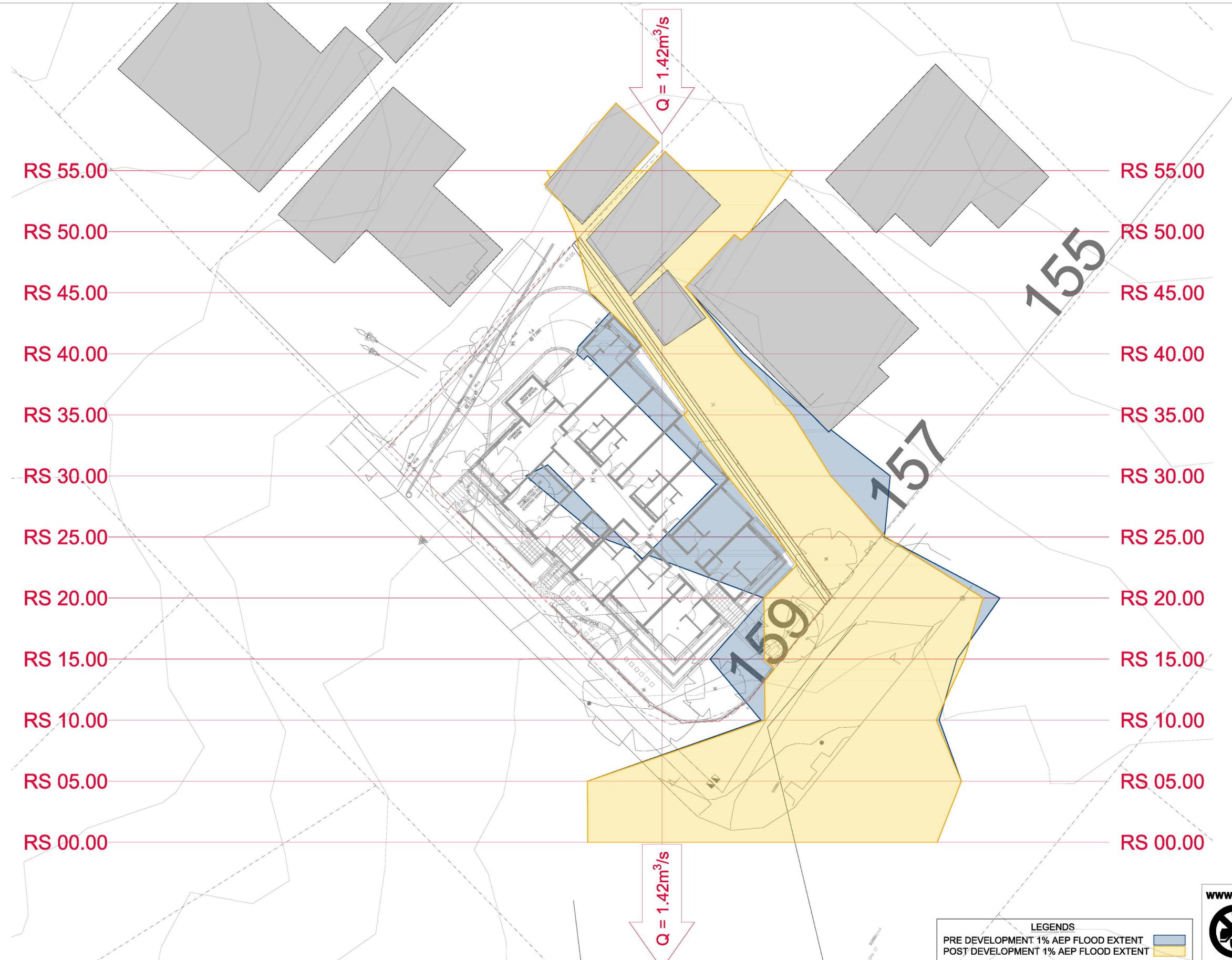


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DRAWING TITLE		
POST DEVELOPMENT 1% AEP FLOOD EXTENT		
SCALES AS SHOWN	DESIGNED RP	DRAFTED RP
DRAWING NO. A8388 - FS02	APPROVED JM	REVISION A



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 159 JAMISON ROAD,
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DRAWING TITLE		
PRE VS POST DEVELOPMENT 1% AEP FLOOD EXTENT		
SCALES AS SHOWN	DESIGNED RP	DRAFTED RP
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LEGENDS

LOW LEVEL FLOOD HAZARD ZONE

HIGH LEVEL FLOOD HAZARD ZONE

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REVISION	AMENDMENT	ISSUE DATE
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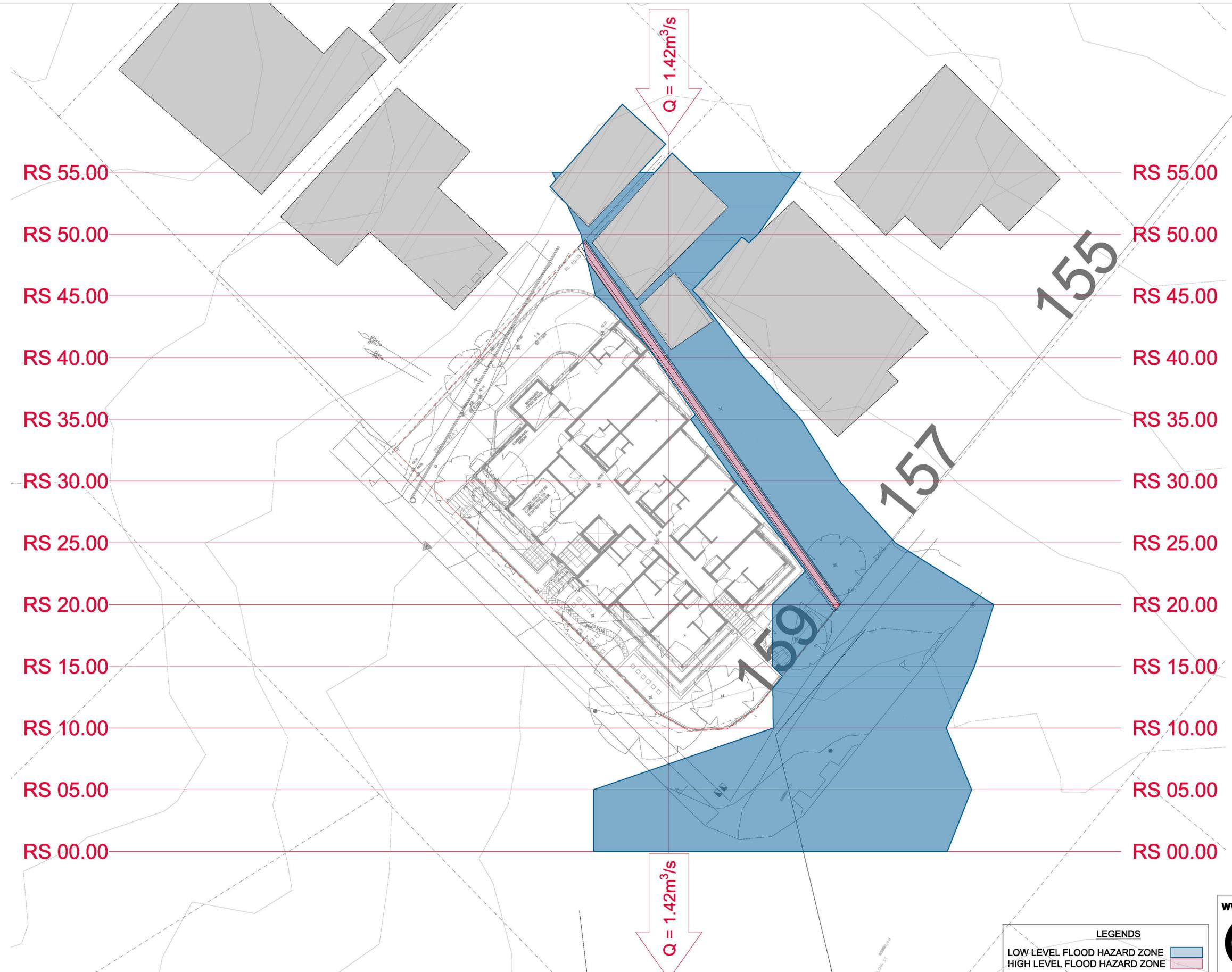
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**PROPOSED DEVELOPMENT
 159 JAMISON ROAD,
 PENRITH**

DRAWING TITLE		
HYDRAULIC FLOOD HAZARD PRE-DEVELOPMENT		
SCALES AS SHOWN	DESIGNED RP	DRAFTED RP
DRAWING NO. A8388 - FS04	APPROVED JM	REVISION A



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LEGENDS

LOW LEVEL FLOOD HAZARD ZONE	
HIGH LEVEL FLOOD HAZARD ZONE	

REVISION	FLOOD EXTENT AMENDMENT	ISSUE DATE
A		06-02-2019

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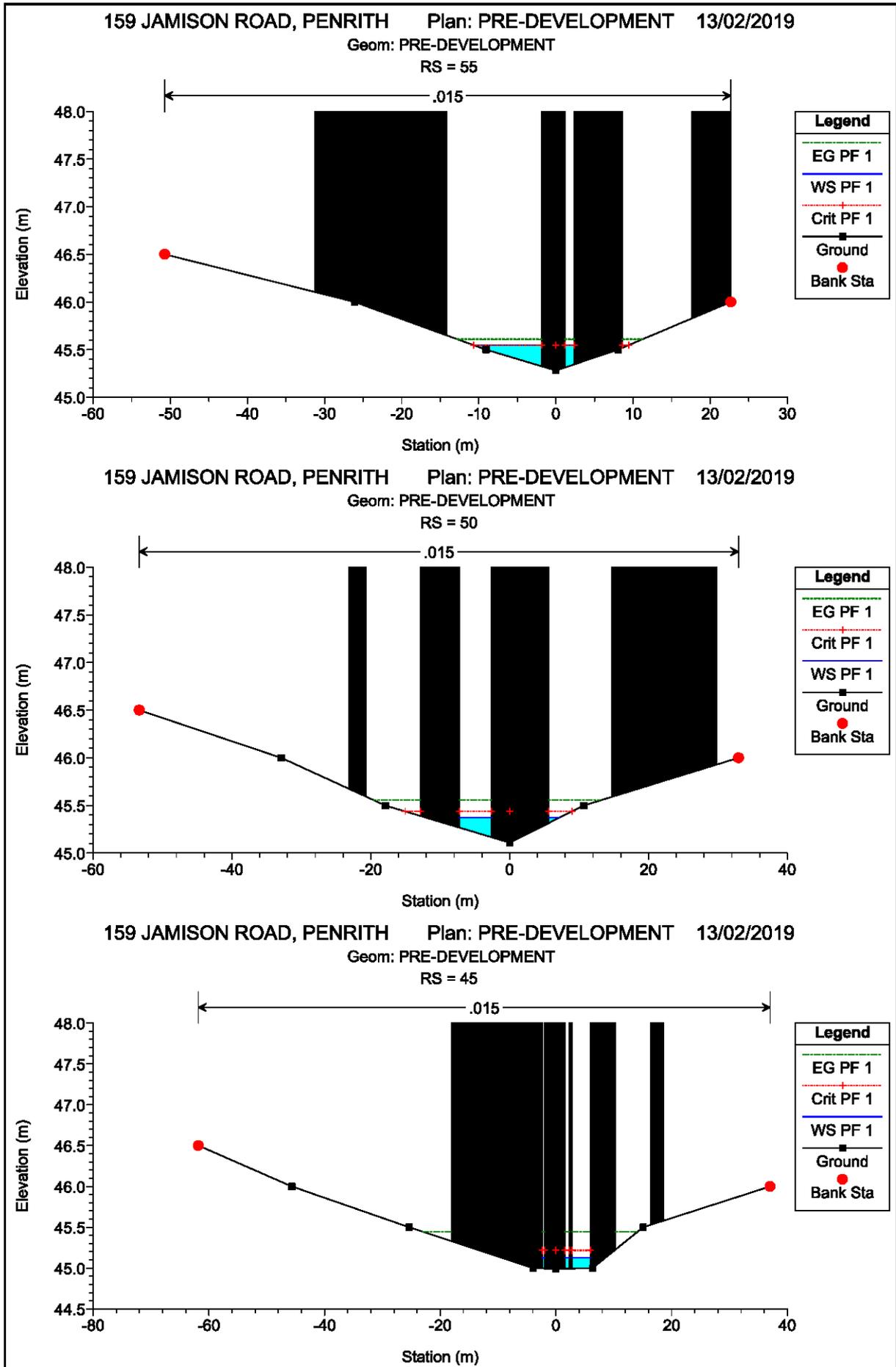
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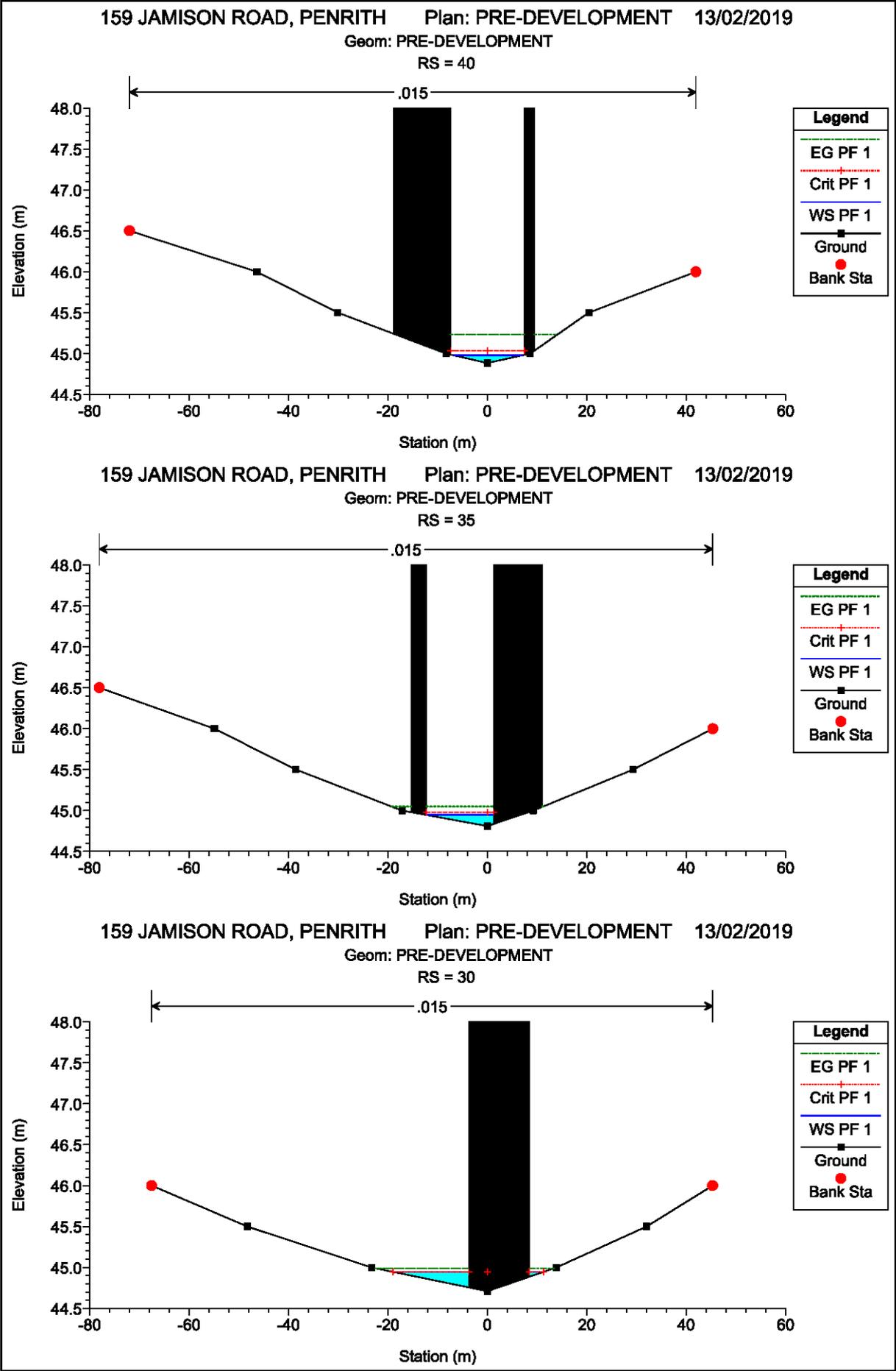
PROJECT
**PROPOSED DEVELOPMENT
 159 JAMISON ROAD,
 PENRITH**

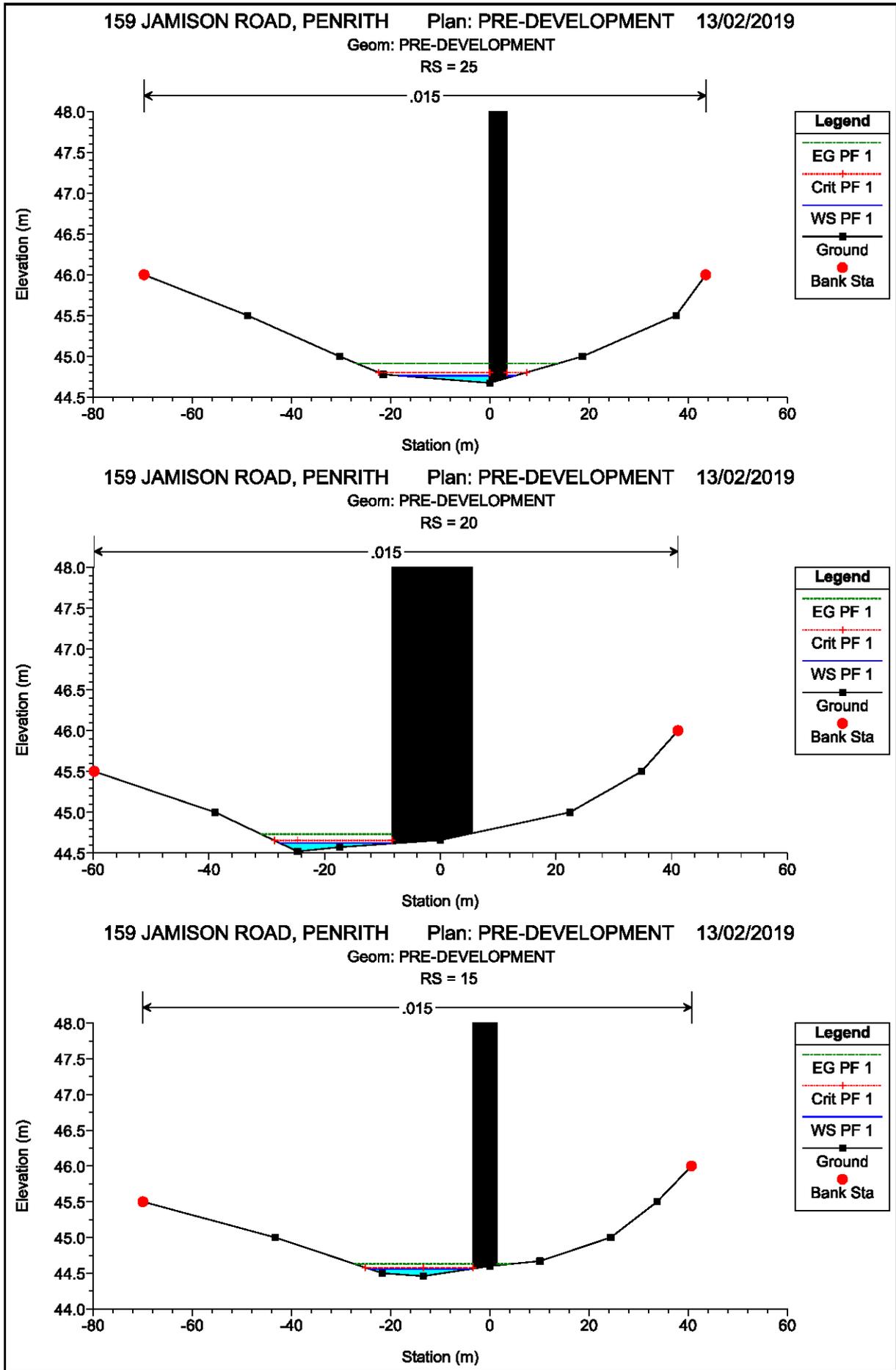
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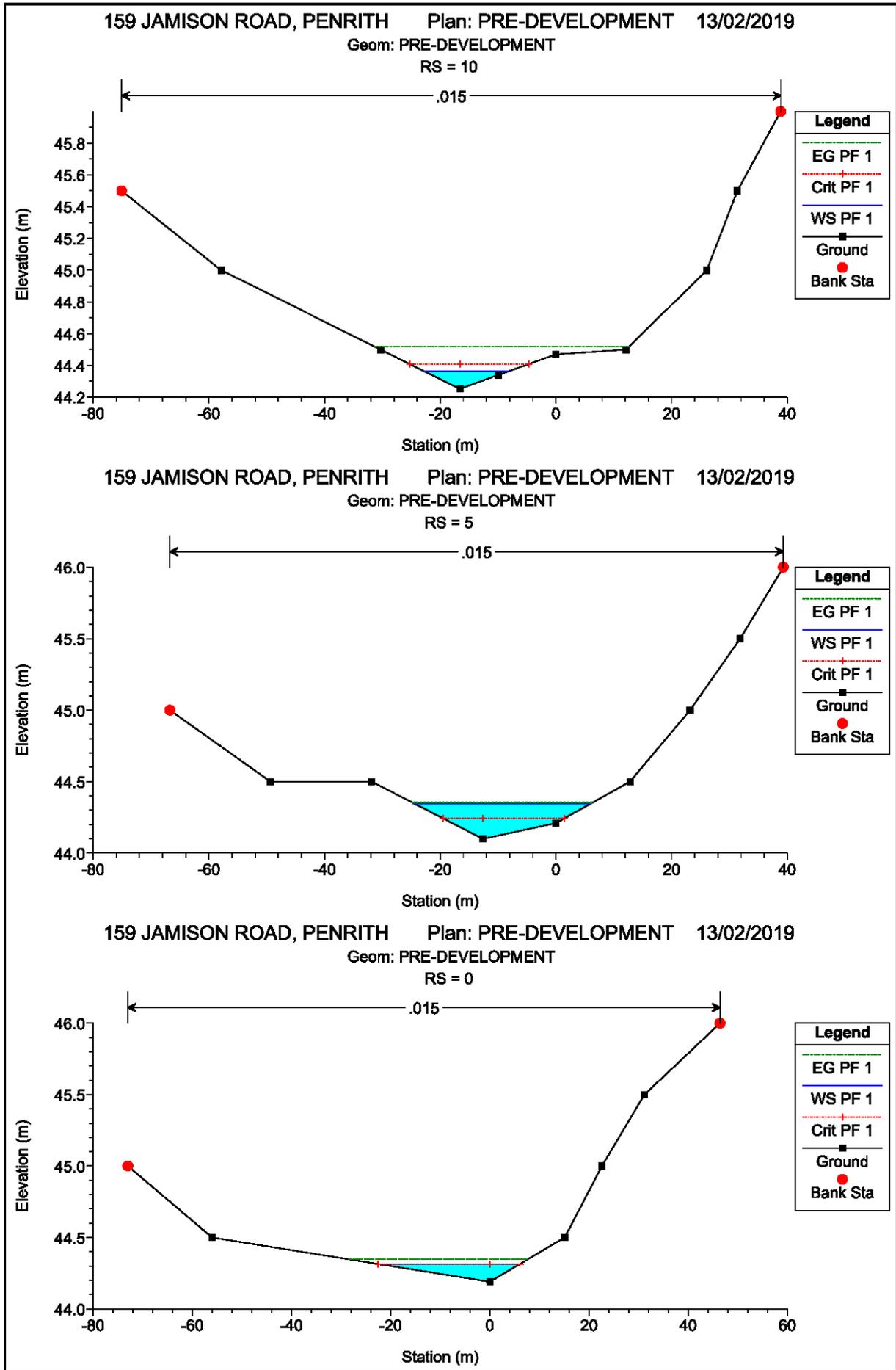
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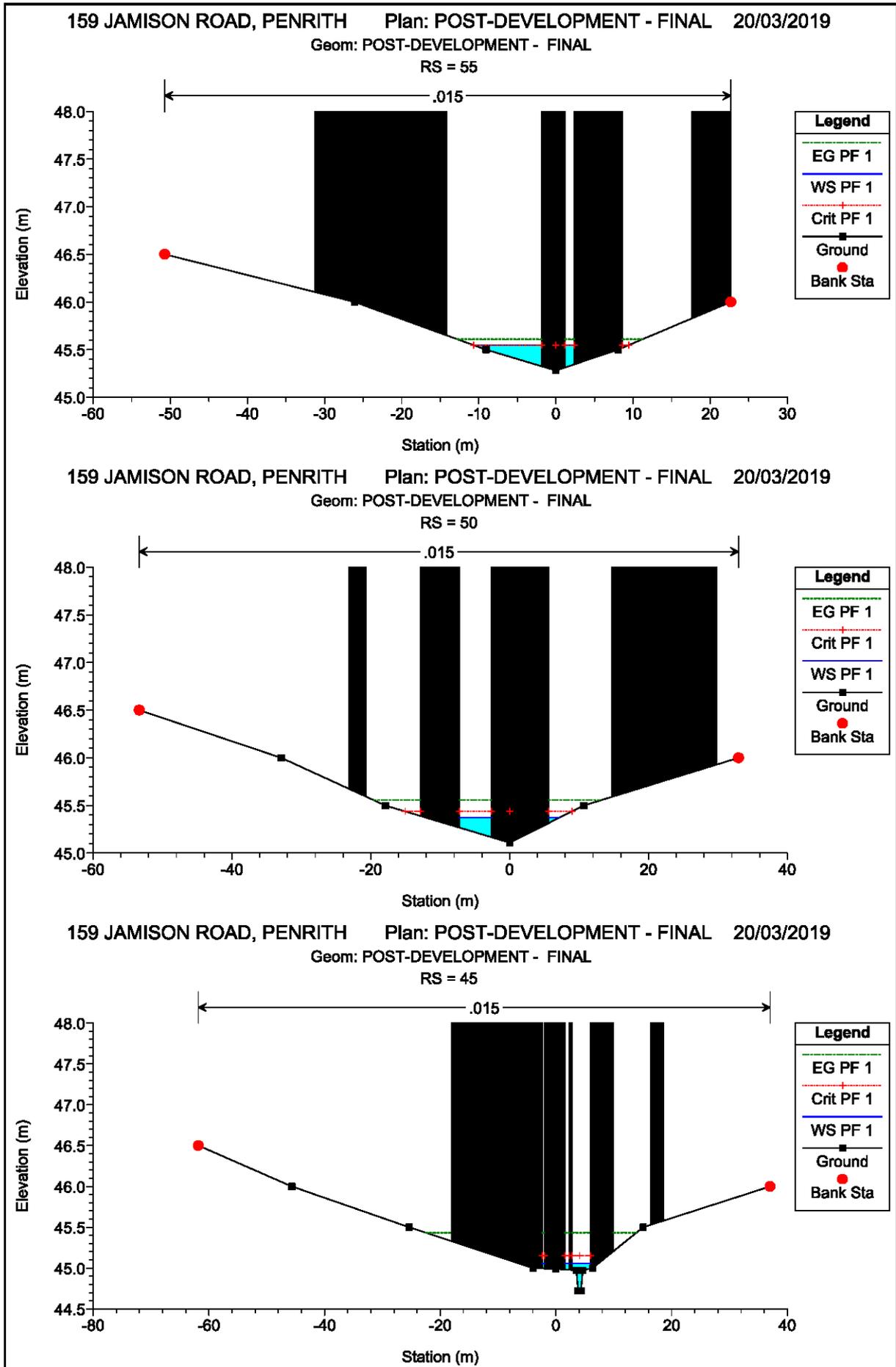
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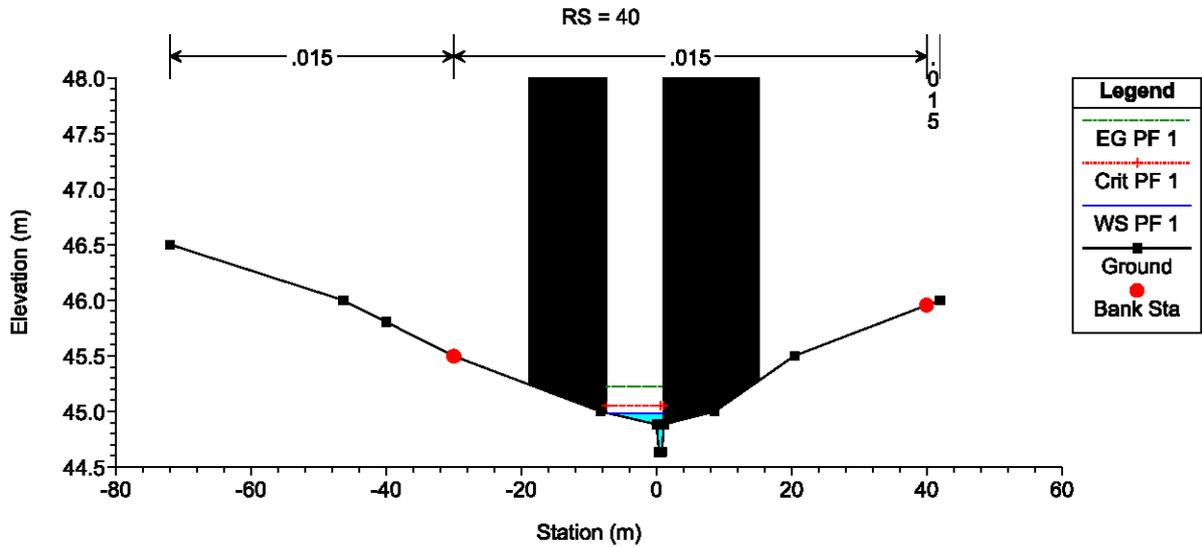




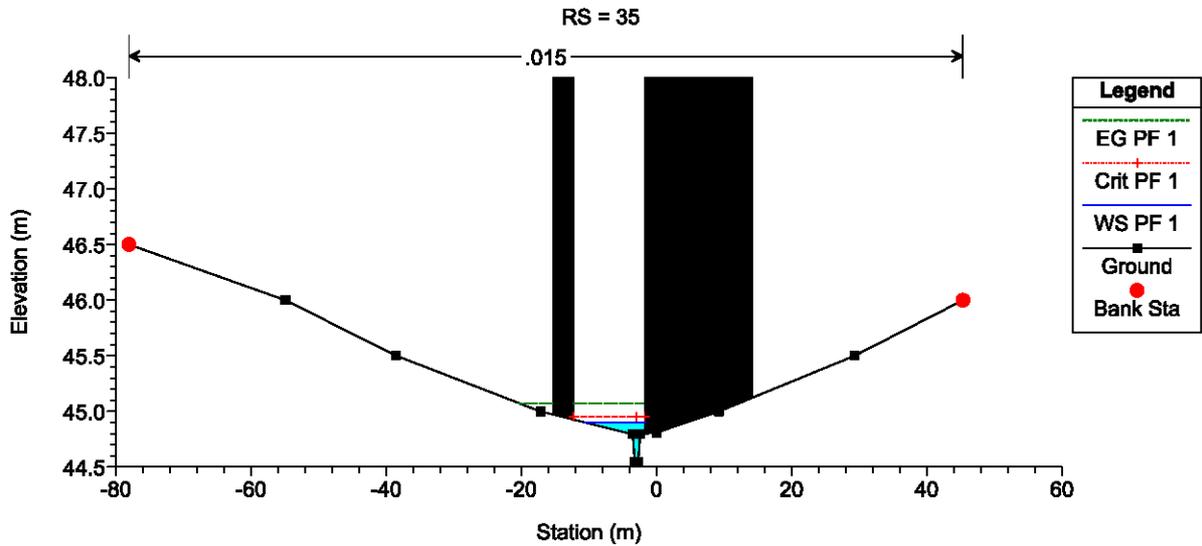




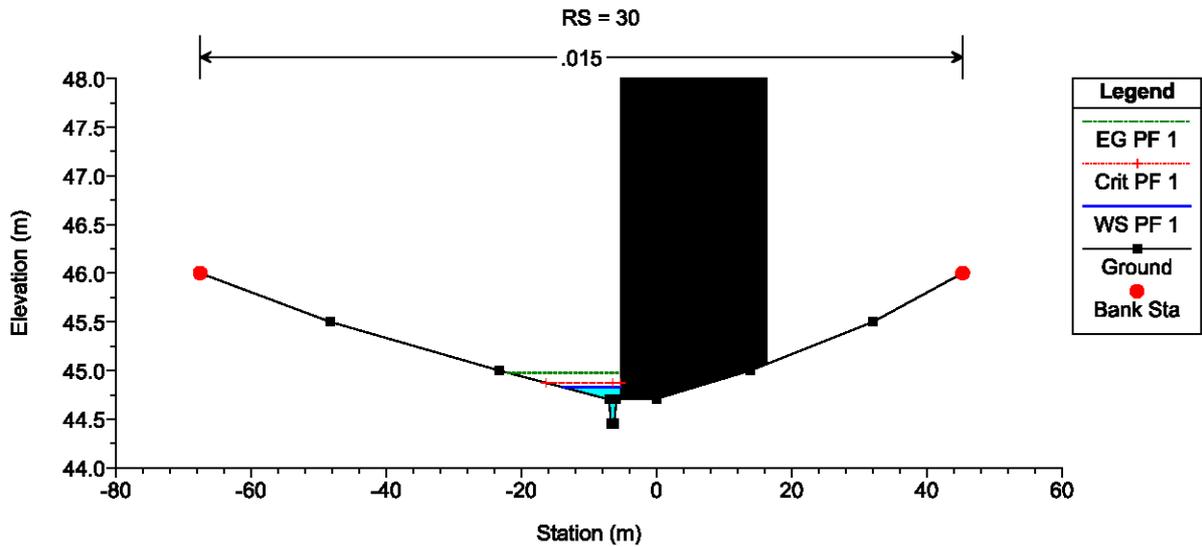
159 JAMISON ROAD, PENRITH Plan: POST-DEVELOPMENT - FINAL 20/03/2019
 Geom: POST-DEVELOPMENT - FINAL

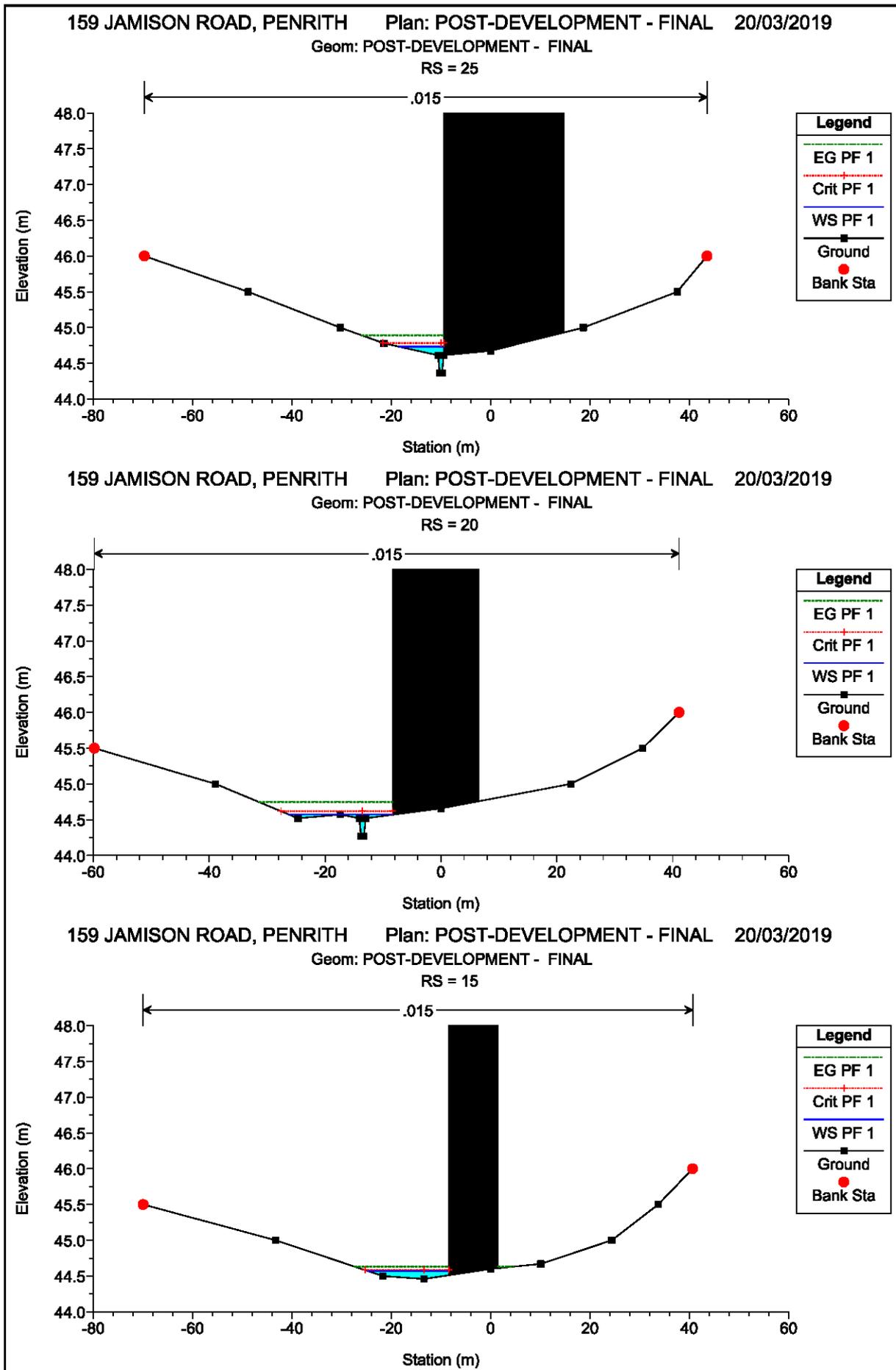


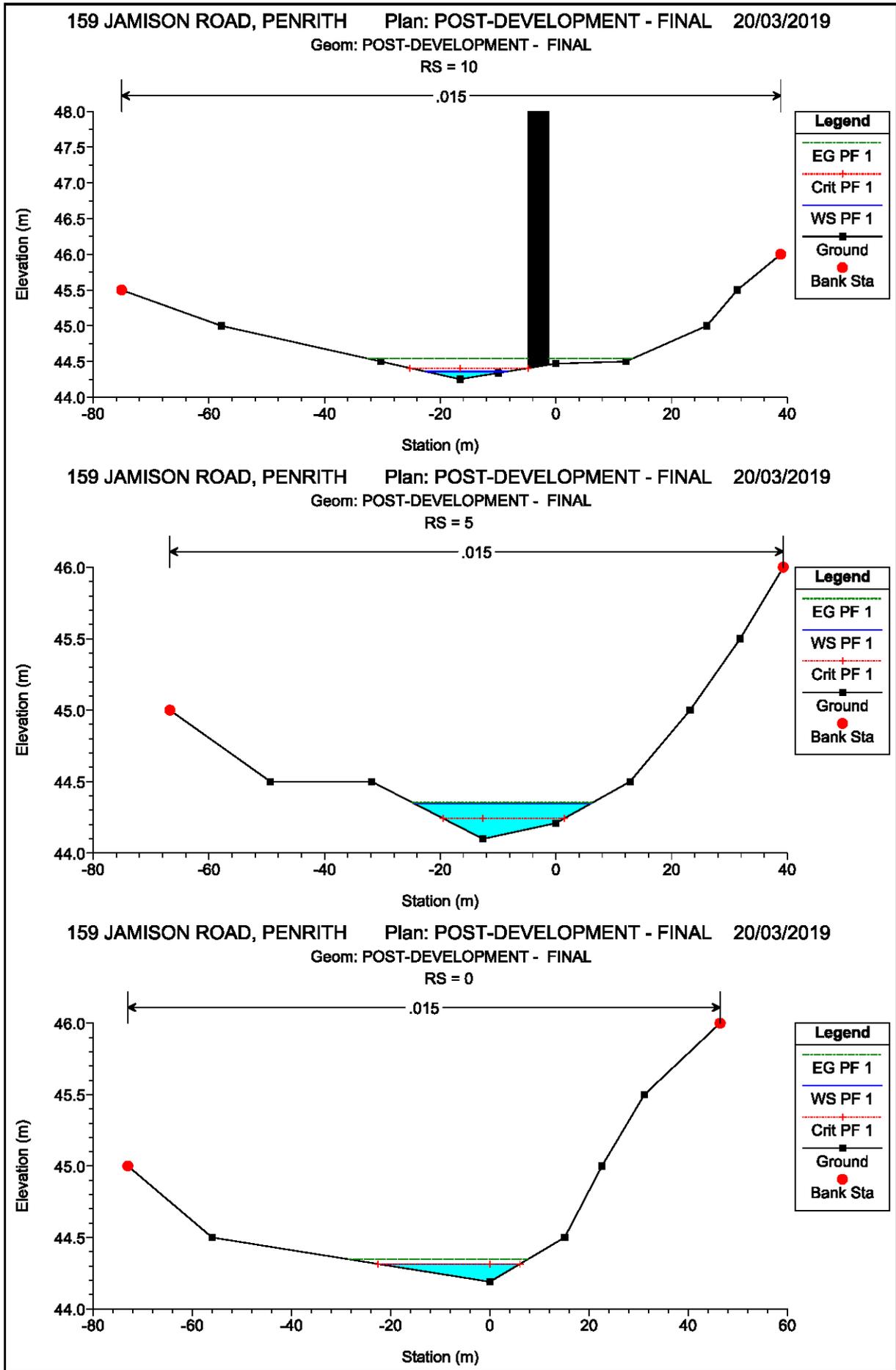
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Reach	R5	Profile	Plan	Q Total (m3/s)	W.S. Elev (m)	E.G. Elev (m)	E.G. Slope (m/m)	Max Chl Dpth (m)	Vel Chnl (m/s)	Hydraulic Hazard (D x V)	Hazard Category (FDM)	Hazard Category (ARR Guidelines 2016)	Flow Area (m2)	Top Width (m)
1	55	PF 1	PRE DEV	1.42	45.55	45.61	0.004975	0.24	1.09	0.2616	LOW	H1	1.3	10.89
1	55	PF 1	POST	1.42	45.55	45.61	0.004975	0.24	1.09	0.2616	LOW	H1	1.3	10.89
1	50	PF 1	PRE DEV	1.42	45.37	45.56	0.014574	0.2	1.9	0.38	LOW	H1	0.75	6.15
1	50	PF 1	POST	1.42	45.37	45.56	0.014574	0.2	1.9	0.38	LOW	H1	0.75	6.15
1	45	PF 1	PRE DEV	1.42	45.13	45.45	0.026482	0.13	2.5	0.325	LOW	H5	0.57	4.34
1	45	PF 1	POST	1.42	45.06	45.43	0.033277	0.33	2.72	0.8976	HIGH	H5	0.52	4.34
1	40	PF 1	PRE DEV	1.42	44.98	45.23	0.066159	0.09	2.22	0.1998	LOW	H5	0.64	13.68
1	40	PF 1	POST	1.42	44.98	45.23	0.03272	0.35	2.18	0.763	HIGH	H5	0.65	8.18
1	35	PF 1	PRE DEV	1.42	44.95	45.05	0.014891	0.14	1.42	0.1988	LOW	H1	1	13.53
1	35	PF 1	POST	1.42	44.9	45.07	0.020674	0.36	1.84	0.6624	HIGH	H1	0.77	8.9
1	30	PF 1	PRE DEV	1.42	44.94	44.99	0.005858	0.19	0.96	0.1824	LOW	H1	1.47	17.67
1	30	PF 1	POST	1.42	44.83	44.98	0.01541	0.37	1.71	0.6327	HIGH	H2	0.83	8.48
1	25	PF 1	PRE DEV	1.42	44.76	44.92	0.046866	0.09	1.73	0.1557	LOW	H1	0.82	19.76
1	25	PF 1	POST	1.42	44.73	44.89	0.018355	0.37	1.77	0.6549	HIGH	H1	0.8	9.01
1	20	PF 1	PRE DEV	1.42	44.62	44.73	0.025948	0.1	1.46	0.146	LOW	H1	0.97	19.37
1	20	PF 1	POST	1.42	44.58	44.75	0.050835	0.31	1.83	0.5673	HIGH	H4	0.77	17.97
1	15	PF 1	PRE DEV	1.42	44.56	44.63	0.013975	0.1	1.19	0.119	LOW	H1	1.19	20.25
1	15	PF 1	POST	1.42	44.57	44.63	0.007736	0.11	1.08	0.1188	LOW	H1	1.31	16.39
1	10	PF 1	PRE DEV	1.42	44.36	44.52	0.032318	0.11	1.75	0.1925	LOW	H1	0.81	14.64
1	10	PF 1	POST	1.42	44.36	44.54	0.040286	0.11	1.9	0.209	LOW	H1	0.75	14.05
1	5	PF 1	PRE DEV	1.42	44.35	44.35	0.000322	0.25	0.33	0.0825	LOW	H1	4.36	30.67
1	5	PF 1	POST	1.42	44.35	44.35	0.000322	0.25	0.33	0.0825	LOW	H1	4.36	30.67
1	0	PF 1	PRE DEV	1.42	44.31	44.35	0.005684	0.13	0.79	0.1027	LOW	H1	1.79	28.68
1	0	PF 1	POST	1.42	44.31	44.35	0.005684	0.13	0.79	0.1027	LOW	H1	1.79	28.68



Our reference: ECM 8449343
Contact: Ratnam Thilliyar
Telephone: (02) 4732 7988

9 November 2018

Ms Jennifer Azzi
PO Box 178
BELFIELD NSW 2191

Dear Ms Azzi

Flood Level Enquiry
Lot B DP 413314 - No. 159 Jamison Road, Penrith

Please find enclosed Flood Level information for the above property.

Should you require any further information please do not hesitate to contact me on (02) 4732 7988.

Yours sincerely

Ratnam Thilliyar
Engineering Stormwater Supervisor

Flood Information

Lot B DP 413314 - No. 159 Jamison Road, Penrith

Date of issue: 9 November 2018

The 1%AEP local overland flow flood level affecting the above property is estimated to be RL 45.4m AHD.

Property less than 0.5m above the 1% AEP flood level is subject to Penrith Development Control Plan 2014 Section C3.5 Flood Planning. The Penrith Development Control Plan 2014 is available from Council's website www.penrithcity.nsw.gov.au.



Definitions

AEP – Annual Exceedance Probability – the chance of a flood of this size occurring in any one year.

AHD – Australian Height Datum – A standard level datum used throughout Australia, approximately equivalent to mean sea level.

Legend

 Extent of 1% AEP local catchment overland flow path. Generally depths less than 150mm is not shown.

Notes:

- The contours shown above in yellow numbering are at 0.5m intervals and are based on Aerial Laser Scanning (ALS) Survey undertaken in 2002. The contour levels are approximate and for general information only. Accurate ground levels should be obtained by a Registered Surveyor.
- The flood level is based on current information available to Council at the date of issue. The flood level may change in the future if new information becomes available. The 1% AEP flood is the flood adopted by Council for planning controls. Rarer and more extreme flood events will have a greater effect on the property.
- Council's studies are reflected in flood mapping for the City which show properties potentially affected by overland flows in excess of 150mm.
- This property is shown on Council's flood mapping as potentially so affected.
- Council imposes flood related development controls where, in its opinion, such controls are justified. Such controls may or may not be imposed with respect to this property in the event of an application for development consent.
- If a development proposal is submitted with respect to this property, Council will consider the possibility of flood or overland flow in the context of the application. Council may impose a requirement that the applicant for development consent carry out a detailed assessment of the possible overland water flows affecting the property (a flood study) and/or may impose other controls on any development designed to ameliorate flood risk.
- You are strongly advised if you propose to carry out development upon the property, that you retain the assistance of an experienced flooding engineer and have carried out a detailed investigation.
- Council accepts no liability for the accuracy of the flood levels (or any other data) contained in this certificate, having regard to the information disclosed in Notes "1" to "4". As such you should carry out and rely upon your own investigations.


Ratnam Thilliyar
Engineering Stormwater Supervisor

